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Overproduction in Rubber.

Some months ago, in this journal, we gave a warning note that the time of overproduction in rubber was not so far off as some people seem to think, and this was followed up by the lecture on the subject given by Mr. Wright at the Rubber Exhibition. Many people seem to think that we were prophesying the almost immediate fall of rubber prices below a remunerative level, and it may be well to discuss the question so far as is necessary to make the position a little more clear.

In January 1903, the price of fine hard Para (South American) was 3*s*. 8*d*., and it rose fairly steadily until May 1905, when it touched the extraordinary figure of 5*s*. 9*d*., and since that time it has fallen, till it has reached 5*s*. 1*d*. Now, in previous years the price was rarely above 3*s*. 6*d*., which in a way we may therefore regard as the normal (higher) price of Para rubber. The rise of late is due to temporary scarcity, which will probably be done away with by the increase to be expected before very long in the output of plantation rubber.

Many people think that so many new uses for rubber will be discovered that the price will remain at the present high level for a long time. On the other hand, we are of opinion that the present price is too high for the economical use of rubber in many uses that are known of already. Take for instance the one great use of pavement; rubber is known to suit admirably for this, and to last almost indefinitely, yet it is not used for it, though even at the present prices, its durability is so great that it would probably be about as cheap as wood.

The real stimulus to the use of rubber for new purposes, will, it seems to us, hardly come before its price goes back to what we have looked upon above as normal, viz., 3*s*. to 3*s*. 6*d*. a pound. When, by the increase in production of plantation rubber, that figure is once again reached, we may look to see rubber taken up for pavement, and for many other uses, which will keep the price from falling much below that figure for a long while to come; and we should regard any venture in which the price of rubber was put down above 3*s*. as a very speculative one.

GUMS, RESINS, SAPS AND EXUDATIONS.

Rubber Cultivation and the Future Production.

By Herbert Wright.

A Lecture delivered at the Ceylon Rubber Exhibition, Peradeniya, September 17th, 1906.

Discussion on the Necessity of Manuring: Brazilian *versus* Eastern Methods of Preparation.

This lecture was largely attended and produced an animated discussion on a variety of important topics. H. E. the Governor presided, and among those present were:—Mr. and Mrs. R. Morison, Mr. and Mrs. Jas. Ryan, Colonel Byrde, Messrs. Alex. Rettie, G. P. Gaddum, C. O. Macadam, A J. Dawson, E. Hamilton, C. A. Somerville. C. W. H. Duckworth, M. L. Davidson, J. B. Carruthers, E. G. Windle, C. K. Smithett, C. Devitt, Dr. A. Lehmann, Messrs. W. H. Biddulph, Kelway Bamber, R. Anderson, Ivor Etherington, D. S. Cameron, J. Cameron, R. I. Mackenzie Seymour S. Jeffery, R. S. Beling, H. F. Macmillan, G. A. Krumbiegel, R. T. Tipping, C. J. Bayley, Lieut.-Colonel. J. A. Willie, Messrs. E. Blyth, James Morris, Geo. H. Hughes, A. M. Carmichael, C. W. de Hoedt, F. W. de Hoedt, R. H. Perera, G. S. Brown, A. H. Lucas, E. S. Campbell and many others.

THE LECTURE.

The almost impossible task of giving a comprehensive lecture under a time-limit of twenty minutes, on the subject of the cultivation of rubber trees, has fallen to my lot, and we cannot do better than briefly survey, in a very general manner, the chief features of the rubber industry as presented to us to-day. It is a wide subject, and consideration of the hundreds of samples of rubber prepared on these and adjacent shores, or of the implements and machinery used in collecting and coagulating latex, and curing rubber, and many other matters must be held over for other occasions.

SELECTION OF RUBBER TREES FOR CULTIVATION.

The first point we have to consider is that of the selection of rubber trees for cultivation. We are often told that the present boom in rubber in Ceylon, Federated Malay States, the Straits, Java, Borneo and India, &c., is only a forecast of disaster, and that we are engaging ourselves in a cultivation which, though lucrative enough while maximum market values obtain, will prove unremunerative when large acreages come into bearing, when substitutes and synthetic rubber gain a better footing, and when diseases begin to spread. We are reminded, often by very earnest men, that our cultivated rubber trees are not indigenous in the East, and we have been assured that sooner or later the histories of coffee and cinchona will therefore be repeated; these assertions, if correct, should be received with more serious consideration than at present. In the first case, however, I desire to point out that we are preparing to combat diseases when they arise, and after thirty years' experience, on somewhat small plantations in Ceylon and the F.M.S., no difficulties have been observed except those which can be overcome. The plea that we cannot succeed with our rubber trees because they are not indigenous is not well-founded. We cultivate cacao as successfully in Ceylon as others do in Central and South America or the West Indies, where it is said to be indigenous, our tea compares favourably with that in Indian and other districts where it occurs wild, and our oil cultivations will stand a comparative investigation. The greater number of the past and present planting industries of Ceylon are the outcome of the cultivation of species which do not occur here in the wild state; the

indigenous plants capable of being regularly and largely cultivated in Ceylon are very few and are typified in our cinnamon. With reasonable confidence do we therefore look forward to the cultivation of species introduced from other countries, and among them must now rank those from which rubber is obtainable.

HEVEA BRASILIENSIS : FIRST RANK.

The question as to which is the best species to adopt in cultivation is one which is frequently raised, and with this we can now deal. The species which has been vigorously planted in the East is *Hevea brasiliensis*, and in view of the present importance of this species in the plantation rubber industry we might well ask, have we, or have we not, selected an inferior type? Are we, after all, on the wrong track? Are we extending this particular cultivation too much and neglecting others? Thanks to the energy of all concerned, and especially to competitors in this exhibition, these questions can be answered fairly satisfactorily. The extension in the cultivation of Para or *Hevea* rubber has been steady, and except for the last few years slow, and has been influenced by the results obtained during twenty years of patient waiting and working; we have not based our anticipations simply on a single experiment with a single species, but rather on a wide knowledge of the real value of many rubber producing plants. We have our Ceara rubber trees (*Manihot Glaziovii*) scattered throughout Ceylon, from the dry hot districts of the North, East and West, to the damp and cooler areas in the South; we have had them for over twenty year at altitudes varying from sea-level to over 4,000 feet, and visitors from other climes assure us that the growth obtained in Ceylon is as good as that in tropical America. Similarly Castilloa (*Castilloa elastica*) has been cultivated in districts with different climates, Gutta Rambong (*Ficus elastica*) *Landolphia*, and *Funtumia elastica* are also known in Ceylon, and plants of the *Sapium*, Palaquium (*Gutta percha* and Balata (*Mimusops Balata*) have also been tried. The literature of the tropica world has enabled us to learn something about the value of Root rubbers, the Guayule (*Parthenium argentatum*), *Urceola* and several climbing and herbaceous plants; our judgment is therefore not based on fanciful or passing rumours. The opinion of most persons vitally concerned in the rubber industry in Ceylon is that where Para rubber will grow, it can be cultivated as the mainstay of the estate. (Hear, Hear.) We even hear of planters removing Gutta Rambong trees and coconut palms to make room for their Hevea trees.

CHARACTERS OF HEVEA.

Para rubber trees grow rapidly; they yield rubber of high quality, they have proved to be very hardy, and we are convinced that they will stand ordinary tapping operations to a remarkable extent. The rate of growth and present immunity from pests of *Hevea brasiliensis* put it, in Ceylon, above Funtumia; its yield places it on an equal or even higher plane than the best Castilloas from Panama or Mexico, and its hardy characteristics and response to the extensive use of the ordinary tapping knife render it superior to Ceara and other rubbers. Each species of rubber tree may thrive in particular districts, and when we can give more time to them, better results may be obtained in Ceylon with other kinds, but the verdict to-day is that Para rubber, as far as we can judge, holds its own in every way—in growth, hardiness, and yielding capacity. The confidence in this species is not confined to the Indo-Malayan region, but has spread to many islands and territories throughout the tropical zone; Africa, or at least the West Coast of that vast continent—with its numerous rubber-yielding indigenous plants will take as many seeds of *Hevea brasiliensis* as we can give, because it has been found to be superior to others native in that area, and even this year thousands of seeds, for planting purposes. have been sent to Brazil, the country whence all our rubber seeds were obtained in 1876 (Applause). We have the assurance of a visitor with African experience, that *Hevea brasiliensis* beats most of the rubbers with which he is acquainted, and many persons

must feel compelled to agree with that conclusion. Knowing how the plants have flourished in the East, it is our next duty to enquire into the available details regarding the commercial value of the produce, the methods of extraction, and the yields obtainable.

COMPARATIVE VALUE OF DIFFERENT RUBBERS.

What do we know regarding the comparative commercial values of the various kinks of rubber? It is true that most of the plantation rubber is valued at the present time according to appearance or physical properties; though most of the wild rubber is appraised by people who, from experience in the manufacture of rubber goods in the factories, know the proportion of essential ingredients in the raw rubber they handle. The home manufacturers are undoubtedly becoming aware of the possibilities in plantation rubber, and though—often for very good reasons—they have looked askance at several consignments, the day must come when from constancy in chemical composition and physical properties, and from the constancy in purity and output, the rubber from cultivated areas will receive their very serious attention. During the last few years the output of wild rubber from several countries has been difficult to accurately forecast, and speculation has naturally followed such a condition of affairs; the sources of plantation rubber on the other hand will ultimately be well-known, and safer calculations of the probable output will be possible. This constancy in output, and a guarantee of quality, grade, etc., possible when dealing with well-managed plantations, will arrest attention in the near future.

VALUE OF PLANTATION RUBBER.

Though our plantation rubber, as at present prepared, may or may not have the best physical properties, we are certain of one thing, and that is that we have selected forms which in contradistinction to others may be described as pure types. The three forms—Para, Castilloa and Ceara—yield rubber possessing a high percentage of caoutchouc, the component on which the real value largely depends, and on account of which the synthetic chemists are working so perseveringly with hope of success. Our Para rubber prepared even in the ordinary way possesses from 90 to 95 per cent of caoutchouc, and some samples of Ceara and Castilloa rubber have from 76 to 90 per cent. Though many of the other rubbers may, when prepared by proper methods, show a higher percentage of caoutchouc than they do at the present time, it is doubtful whether they will ever exceed, by any appreciable amount, the 95 per cent of caoutchouc which has been proved to occur in some samples from *Hevea brasiliensis* and other species. Of course, there are other useful ingredients in rubber and many believe that the proportion of caoutchouc can be reduced with advantage. Undoubtedly the physical properties and the appearance of the plantation rubber can and will be changed in course of time; we know the nature of the processes by which wild rubber is said to acquire some of the physical properties which manufacturers consider desirable. The production of rubber on the same principles as obtain in the Brazilian forests is capable of being carried out in Ceylon, F.M.S., the Straits and India not only as effectively, but at less expense, and the producer in the tropics is only waiting for the unanimous order from the manufacturers to begin work on those lines.

We have been assured by Professor Dunstan, at the meeting of the British Association just concluded at York, that the physical properties of raw rubber, on which its technical value depends, are to be correlated with the chemical composition of the material itself, and we are told that the elastic caoutchouc substance in each of the finest rubbers is ot a similar nature. We already know that there are high percentages of caoutchouc and favourable proportions of other ingredients in our plantation rubber, satisfactory yields are obtainable, and most of the trees, especially of *Hevea brasiliensis*, appear to stand tapping operations even when of a very drastic nature.

METHODS OF EXTRACTING RUBBER.

We have, curiously enough, mainly confined ourselves to extracting latex by methods of tapping which obviate the destruction of the tree. But it is well-known that there are plants such as the Mexican shrub (*Guayule*) which can be grown quickly, uprooted, and the coagulated latex from the whole of the tissues extracted by a process of maceration and washing; the *Landolphias*, Root rubbers, and other plants might be similarly dealt with, and good yields of rubber obtained therefrom—sometimes without the use of such machinery. It would indeed be a fortunate discovery if some herbaceous plant capable of being cultivated in the East as a subsidiary rubber crop in a clearing of Para, Castilloa or Ceara rubber could be found. We have now secured the machinery to extract rubber from dead bark tissues, and it has been questioned in connection with some of our arborescent plants, whether the rubber obtainable at the end of the fourth or fifth year by felling or lopping the tree and macerating the bark is not worthy of consideration. The idea may appear fanciful and even absurd for trees of Para rubber, but it is of considerable interest in connection with the prunings and bark, etc., of Ceara rubber, or of plants which cannot stand tapping. We may subsequently find that we are in the beginning of a new era in the extraction of rubber from some tree forms, by methods other than tapping.

COMPARISON OF PLANTATION YIELDS IN 1905.

Be the growth or methods of cultivation and extraction what they may, the features on which the prosperity of our new cultivation largely rests are the yields obtainable and the period over which such can be guaranteed.

It is certainly too early to make a definite statement on this subject, but it is fairly safe to say that good and most promising yields have been obtained from trees of Para rubber. An annual yield of one pound of dry rubber per tree is perhaps above the average for mature Ceara rubber trees, and many have even questioned whether such an amount can be obtained from Castilloa trees of a fair size and age, whether in the East or West. Para, Ceara and Castilloa can be planted at approximately the same distance apart; so that the yield per tree affords a fairly reliable basis for a comparison of their relative values. The whole of the results which have been obtained up-to-date in Ceylon, Malaya, the Straits and India are not available, but it is interesting to find that in 1905—our first genuine year of working with Para or Hevea rubber trees—we obtained according to the only figures in my possession—in Ceylon from 138,655 trees, 189,743 lb. of rubber; the Straits obtained from a certain 58,860 trees approximately 57,000 lb. of rubber, (these figures do not, of course, give any idea of the total quantities of rubber exported from these countries) and specimens in Africa and India show a promised yield of form ½ to over 1 lb. of rubber per tree. To put it briefly, an average yield of about 1 to 1½ lb. per tree has been obtained from nearly 198,000 trees, at a time when the methods of extraction were novelties, and our knowledge of a scanty range.

YIELDS AT HENARATGODA.

Results for several years in succession are available from the Henaratgoda Gardens, where it is hoped to take you before the Exhibition is over. In the old days, when the trees were lightly tapped only every second year on an antiquated system, a yield of 1½ lb. per tree was obtained, per year, for a period of nine years.

That was from a tree which when first tapped was about fifty inches in circumference and approximately twelve years old. Since then various experiments have been made on the closely-planted Henaratgoda trees, and a yield of from ten ounces to 15 lb. dry rubber per tree has been obtained in less than twelve months, by methods which will certainly not kill the trees under four years. Some old and apparently

dead tree stumps of Para rubber appear to be still keen on yielding latex, though they have not produced a single leaf during the last three years. Estates in Ceylon are known where average annual yields of ¾ to 3 lb. of rubber per tree, for a few years in succession, have been obtained.

PRESENT AND FUTURE METHODS.

As has been previously explained, the bark is the "mother of rubber," and by the adoption of better systems of tapping, which obviate the necessity of paring away the tissues wherein the milk accumulates, and drawing supplies of latex by merely cutting and not excising the laticiferous tissues, is bound to result in an increased yield since the life of the tapping area is so much prolonged. The fact that a few well-developed trees have been made to give as such as 12 to 25 lb. of rubber per year, and promise abundant yields in the very near future, shows what a tremendous amount of material there is to draw upon, providing the environs of the plant and tapping operations are fully understood.

Ten years hence we shall probably smile, or appropriately express our feelings in other ways, when we look back upon the methods we employed in the collecting of latex and preparation of rubber therefrom, in the year 1906, or when we reflect on the satisfaction with which we viewed our crude ideas and forecasts in the memorable year of the first Ceylon Rubber Exhibition. However, we are not only willing but anxious to forget what little we know at the present time for anything which will improve our future prospects.

EFFECT OF CONTINUOUS RUBBER CULTIVATION.

While rubber cultivation is in its infancy it will be as well to consider the probable effect, in a comparative way, of its prolonged cultivation. The effect of growing rubber trees is, especially with plants which, like *Hevea, Castilloa* and *Ceara,* annually shed all their leaves, to be compared with that of a deciduous forest vegetation; the chemical investigations made at Henaratgoda show that the soil may be improved in certain directions by growing Hevea trees for a period of 29 years. If the rubber trees are grown in association with a permanent intercrop of cacao, or a more or less transient crop of coffee, tea, cotton, camphor, etc., the conditions are quite changed and many results are obviously possible. But when the extraction of the product from rubber trees is considered, one can see that the removal of the latex, and nothing more, necessitates very little exhaustion to the soil. Compared with tea and even with coconuts or cacao, the soil exhaustion following the removal of two pounds of latex per tree, per year, appears remarkably small.

Unfortunately, however, we have not arrived at that stage of perfection when the latex can be extracted by the simple incision of the laticiferous tubes, and it is only possible to compare present methods of bark excision with those meted out to cinchona in the past.

RUBBER LAND AVAILABLE IN THE TROPICS.

Comparing the past with the present, the planters in the tropics can already profit considerably. In the old days Para rubber was planted mainly along streams or the banks of rivers, near sea-level; but to-day we know that, though in the Straits the cultivation appears to limit itself to places at a low altitude, in Ceylon it can be grown successfully, and rubber of good value be obtained from trees at an elevation of 2,000 feet and even at nearly 3,000 feet about sea-level in districts with a high temperature and poor rainfall. In Southern India even 3,000 feet is not accepted as the maximum elevation at which *Hevea brasiliensis* can be slowly but successfully grown.

Furthermore, our experience of the growth of rubber plants in soils of different kinds has taught us that in addition to alluvial banks there are soils, which, though they are perhaps of a poorer type, give satisfactory results, and to-day even swampy patches which have never been known to be capable of yielding paying crops before, are now growing excellent rubber trees; swamps should, of course, be well drained and otherwise properly treated.

The climatic or soil conditions under which it has been proved that rubber plants can be successfully cultivated in Ceylon, the Straits and India, have aroused the interest of almost every institution in the tropical world, and it would be idle to even wildly guess at the thousands of acres which could now be made to grow rubber in the Malay Archipelago, Ceylon, the West Indies, Africa, and parts of South and Central America. Rubber cultivation is now rapidly developing into a science, better work is being done in planting operations, more care is being exercised in eradicating pests as soon as they appear, and admirably skill is being displayed by the producers in their efforts to place on the world's market the best quality of rubber they can.

THE OTHER SIDE.

My remarks to you to-day may be regarded as very optimistic; but it would be difficult to be otherwise in the face of the work accomplished and the immediate prospects before us. There are gloomy aspects to every industry, but those associated with rubber cultivation are no more serious than those which face the tea, cacao, coconut and other industries on which this and other countries have largely developed. We are told that our black pages are full of unpleasant possibilities; we have to face the contention that though the consumption of rubber will probably increase at a more rapid rate when prices are easier, yet at the same time the plantation supply promises to increase at a rate which is sometimes alarming, and which together with the impetus given to the collection of wild rubbers in African and tropical American territories, may have an effect not in accordance with our desires. The planting of quarter-million acres of rubber plants in a small fraction of the Indo-Malayan region alone, within a few years, will show what can be done, and our activity is not likely to be ignored in other parts of the world where rubber plants can be grown,

THE PLANTATION SUPPLY.

When one reflects on the land already yielding or alienated for rubber in the East, and considers its potentialities in relation to last year's consumption of, let us say, in round numbers, about 60,000 tons of rubber and a future yearly increase of about 5,000 tons per year, it is with surprise that one realises that there is a limit to the extension in this particular cultivation. Consider for a moment what 60,000 tons of wild rubber (equal to 48,000 tons of pure rubber) represent; assuming that, on an estate, each tree yields only ¾ lb. of rubber per year, and that there are 150 trees to an acre, you have a means of providing one ton of pure rubber from every twenty acres of land. Yet, about 60,000 or perhaps 68,000 tons of wild rubber were gathered last year, a yield which will probably not diminish for many years, and one which is the equivalent of 48,000 tons of pure plantation rubber or about nine hundred and sixty thousand (960,000) acres of cultivated land.

Our quarter-million acres of cultivated rubber land, on this modest basis of 150 trees per acre, and each tree yielding only ¾ lb. of rubber, will give us 12,500 tons of rubber, per year, in say five, six or seven years from now; it is therefore only necessary to quadruple the present plantation rubber area in the Indo-Malayan region alone, to subsequently supply the equivalent of the whole of last year's consumed rubber. If you allow, as you may reasonably do, that the yield from cultivated rubber trees will be 1½ lb. per tree, or 2 cwt. per acre, your future extension is further reduced. Dr. Willis has already given you a warning based on an estimate of about 200 lb. of rubber per acre, per year,

LOOKING AHEAD.

Take up another position and imagine that in a few years from now the annual consumption of wild rubber will be about 100,000 tons (say equal to 80,000 tons of pure rubber). What acreage of rubber plants would be required to secure such an amount? How much of the required acreage have you already got? A demand of 100,000 tons of wild rubber per year can be met by the produce from 1,600,000 cultivated acres; already wild sources, calculated on the above basis, supply the equivalent of 960,000 cultivated acres. The Indo-Malayan region alone has alienated 250,000 acres, thus leaving much less than another half million acres to be opened by ourselves and by others—there are others, please remember—in Africa, South America, Central America, West Indies, etc., as a reference to recent concessions, each of a thousand of square miles, indicates.

One may reasonably imagine that others, outside our little eastern circle, have possibly already secured the balance of land to satisfy this demand. I have taken the opportunity to discuss these figures with judges and others at this Exhibition, and now give them perchance they may be of interest. I am by no means wedded to these figures if anyone else can produce a better or more reliable series.

INTERESTING AND UP-TO-DATE FIGURES.

Let the consumption for 1905 be 60,000 tons of wild rubber equivalent to 960,000 cultivated acres. (60,000 tons wild equaling approximately 48,000 tons plantation). Let the rubber acreage in the Indo-Malayan region for 1906 be 250,000 acres.

Distance of trees apart.	Trees per acre. (approximate)	Yield of rubber per tree, per annum.	Approximate yield per annum. per acre,	Yield of pure rubber from 250,000 acres (approximate)
20 by 15 ft.	150	¾ lb.	1 cwt.	12,500 tons
,,	150	1½ ,,	2 ,,	25,000 ,,
,,	150	3 ,,	4 ,,	50,000 ,,
15 by 15 ft.	200	3 ,,	5·3 ,,	66,200 ,,

198,000 young and old trees in Ceylon and the Straits gave in 1905 about 240,000 lb. of rubber.

10,000 trees in Ceylon, average age about 10 years, gave 30,000 lb. of rubber in 1905.

FURTHER INTERESTING AND ORIGINAL FIGURES.

Let the demand be 65,000 tons of wild rubber in 1906.

For argument's sake let the demand increase at the rate of 5,000 tons of wild rubber per year; 5,000 tons of wild rubber equal 4,000 tons of plantation rubber, allowing the difference in impurities to be approximately 20 per cent.

Let the supply from will sources remain constant at 60,000 tons per year.

Then what cultivated acreage will be required, assuming that each tree gives only ¾ lb. of rubber, and each acre has only 150 trees?

Year.	Demand for Rubber	Wild Sources.	Balance of Wild Rubber required,	Cultivated acreage required to supply Balance (Approximate.)
	Tons.	Tons.	Tons.	Acres.
1906	65,000	60,000	5,000	80,000
1907	70,000	60,000	10,000	160,000
1908	75,000	60,000	15,000	240,000
1909	80,000	60,000	20,000	320,000
1910	85,000	60,000	25,000	400,000
1911	90,000	60,000	30,000	480,000
1912	95,000	60,000	35,000	560,000
1913	100,000	60,000	40,000	640,000
1914	105,000	60,000	45,000	720,000
1915	110,000	60,000	50,000	800,000
1916	115,000	60,000	55,000	880,000
1917	120,000	60,000	60,000	960,000

These calculations are based on the minimum yield per acre; a higher yield from our trees means a reduction in the cultivated acreage required.

It should be remembered that the 250,000 acres planted or alienated in the East in 1906 will not really be giving any rubber much before 1912, and that in that interval prices may vary considerably, more systematic methods will probably be adopted in the collection of wild rubber, new areas exploited, and many extensions and improvements made in all parts of the tropics.

If the increase in consumption is much more rapid, and substitutes are used in proportions similar to those of to-day, then the prospect for the cultivation in the tropics is probably considerably brighter.

The whole subject is very complicated, and I would earnestly ask this audience, in view of the rapid extension of rubber cultivation in many parts of the world, to seriously consider a few of the figures presented to-day.

These figures are given only to attract attention to this part of the subject, and I hope others will compile their own series and see what conclusion can be arrived at.

CAST AWAY GLOOM.

But this is neither the day nor the place for considering the gloomy side, and I gladly leave it to you to reflect on the operations necessary to keep diseases in check, to supply the labour of the future for tapping your recently planted trees, and to consider how high prices, substitutes and artificial rubber are going to affect your otherwise pleasant prospects. The rubber trees, which have been selected for cultivation, easily yield a satisfactory quantity of latex, and I imagine—though I may be quite wrong—that your earliest difficulty will probably be that of procuring the labour necessary to take full advantage of even the quarter million acres, already alienated for, or in, rubber. If it be necessary in order to fully utilise the Para trees, to tap each tree every alternate day, you can imagine the labour force required to work each 500 acre block, possessing, say, 100,000 trees. Even allow that a cooly may properly tap 50 trees per day, and dispose of his produce at the store, you can easily see the demand which will be made on our labour. It may, in the near future, be only possible to tap sections of large estates during alternate years: this would be a great pity and mean so much waste of money.

THE DISCUSSION.

THE NECESSITY FOR MANURING.

Mr. BAMBER :—Your Excellency and gentlemen, Mr. Wright has referred to the exhaustion of the soils by the growth of Para rubber, and I should like to point out that the actual rubber takes practically nothing out of the soil; but at the same time the growth of so many trees largely planted among tea is rapidly exhausting the surface soil of available matter. We are able to replace it very largely by ordinary manurial methods, but at the same time we have not been able to replace that organic matter which is essential for preserving the necessary moisture for an easy flow of latex. I noticed at the Government Plantations at Yatipauwa, where the soil is very poor and of a cabook character, that the trees in order to obtain the organic matter, sent their roots along the surface and up into the dead stump of a tree actually replacing the wood of the same by the roots of the tree growing up in the air. I think we ought to do more to try and increase the humus matter in the soil if we are going to continue a free flow of latex in the future. Mr. Wright referred to the fall of the leaf which certainly replaces to a large extent the manurial and organic matter, but one must remember that there is a very large amount stored up; the *Hevea* being a surface feeder more or less, the exhaustion is rapid. Mr. Wright in his calculation was referring to trees planted 15 by 20. I myself think that ought to be the minimum distance at which rubber should be planted. The actual growth of the roots far exceeds the calculated

foot per year. And in three or fours years roots may extend 15 or 20 feet, and the roots of many trees planted 15 by 20 have already crossed and passed each other forming a lace work. It remains to be seen how far you can cut these roots in order to apply the necessary manure without interfering with the flow of latex in the trees. I think that for that reason alone the greatest care should be taken not to go in for too close planting. Coming here in the train yesterday I noticed rubber planted 8 feet by 8 feet. It seems to me that this is absolutely throwing money away. The soil in Ceylon, although we have some good soil, is not particularly rich—especially in the low-country, and we have to remember that large areas have been more or less exhausted by the growing of tea; but as regards the actual loss from the manufacture and sale of rubber it is practically *nil.* It is a question whether something can be done with the waste waters, but as far as I can see there is very little loss even if this were thrown away and not replaced in the soil. But I certainly think every care should be taken to prevent trees getting set as it were from exhaustion of the soil.

MANURING.

And especially the application of organic matter ought to be taken in hand early if the flow of latex is to be continued. I noticed in working at rubber lately that in the first latex—you have got it in the old figures—the latex contained 32 per cent. of rubber, that is to say that for 3 lb. of latex there was 1 lb. of rubber, but in all the latex sent to me recently, and from what I hear from planters the latex does not now equal that proportion, and the caoutchouc has in some instances gone down to 15 per cent. or less. It seems to me the laticiferous tubes are refilled very rapidly, and the actual flow of water into the tubes also is fairly rapid, but there is apparently a slight want of power of formation of actual rubber in the latex, and this, I think, must be carefully watched in the future. The yield of the trees certainly has not fallen off, but it must mean that there is a much larger proportion of soft laticiferous tissues and larger secretion of moisture which may possibly render the trees more liable to attacks from insects. There is no knowing how this power of the actual formation of the caoutchouc in the latex may fall off. It has already fallen off, and for that reason I think myself manuring should be taken in hand at an early date. Several people have already applied manure to young trees without thinking of the proper method which resulted in their putting in a forcing manure producing an excessive head of leafy growth and which renders them very liable to be blown over by the wind or having their heads broken off, and I think the greatest care must be taken in the manuring of trees—especially if they are planted in tea and if the flow of latex is to be successfully continued. (Applause.)

MR. WRIGHT:—Might I just mention that Mr. Bamber only refers to exhaustion following the extraction of latex, but I think it is quite probable that there will be far more exhaustion following the excision and renewal of the bark, rather than in the extraction of the latex. As you know unfortunately we cut off a large area of bark to get a few pounds of rubber.

MR. BAMBER:—Of course, that exhaustion can be replaced in the estate. It is not actually lost to the estate. It is not removed out of the Island.

MR. WRIGHT:—With regard to the composition of the latex it is interesting to find that though some of the trees at Henaratgoda when first tapped gave latex with only 30 to 50 per cent. of water, the tapping of the renewed bark has often given us latex with as much as 90 per cent. of water.

MR. BAMBER—That is what I say. I say the proportion of caoutchouc is greatly reduced.

H. E. the Governor :—Is there anybody present who can give us information as to the difference in the proportion of caoutchouc in the extraction from wild rubber trees, which has been going on for a good many years, certainly in the Amazon Valley, I do not think quite so long in Africa? But I think rubber extraction from wild trees—the very old trees—has been going on year after year for a good number of years. I do not know whether any gentleman here is able to to tell us whether the proportion of caoutchouc in the latex extracted from those old trees it becoming less.

Mr. Bamber :—I do not know whether they renew the bark like we have to do here, or whether they tap the same trees year after year ; but I doubt whether they measure the latex or weigh the rubber. Apparently they simply dip their paddles and smoke it.

METHODS OF PLANTING.

Mr. Wright :—Mr. Bamber mentioned the distance of 15 × 20 feet which I have adopted in my calculations. I should like to take this opportunity of impressing upon planters that I (personally) am not in favour of close-planting, neither am I in favour of simple wide-planting, the former I consider wrong in principle and the latter wasteful. Elsewhere I discussed one system—close planting and thinning—out, and gave the reasons for and against such a system ; though this system is one which must be adopted on most of the estates already planted in Ceylon, there are other systems such as wide planting and interplanting with cacao, tea, coffee, camphor, etc. ; wide planting and interplanting with arborescent and herbaceous green manures, etc. I am not in favour of originally planting Para rubber plants at a distance which is required when the trees are thirty years old, but am more in favour of interplanting with rubber trees or other products, and subsequently thinning-out, in order to gradually give the remaining rubber trees the increased area which their age and development demand. Para rubber trees are unique in that they give a marketable product in their fourth or fifth years, and yet go on increasing in size until they are over 30 years old. We have no product like it in Ceylon and so far satisfactory results have been obtained by thinning-out of cacao, tea, or rubber trees on well-known and highly-valued rubber estates in Ceylon and elsewhere. The rate of root growth of Para rubber trees, at Peradeniya, was estimated to be approximately one foot radially per year by me ; it was also pointed out that this referred to the compact root areas and not to individual roots which often run out for over four or five feet in a couple of years. In some districts the roots have not even grown at that rate, and in others I believe they have grown more rapidly. My remarks were based on the apparent freedom of the soil from roots, observed when carrying out trench-manuring work ; the roots were never very abundant one foot from one-year-old and two feet from two-year-old Para rubber trees at Peradeniya. I shall be glad to be corrected, especially by the assurance of a more rapid rate of growth for our rubber trees ; I trust that my statement here will remove any doubt as to my opinion being fixed on the question of distance or method of planting Para rubber trees.

BRAZILIAN METHODS OF PREPARATION.

Dr. Christy said there was one point in regard to that subject which was rather interesting, and he noticed Mr. Wright gave a warning on the subject. That was the difference between the two methods of Brazilian preparation and that used here. The Brazilian method is purely one of evaporation. It seemed to him to be a point which was of great interest, and that it was possible it might be found that the success of the rubber industry might depend upon the method of coagulation. No method at present invented turned out the rubber in the same way as Brazil, and it

was important that they should go into the matter more deeply than they had done up to date. What he went upon in one respect was the *Funtumia* rubber in Africa. He had coagulated this rubber by evaporation and sent it home, and that rubber is as good to-day as ever it was—as good as fine hard Para. It seemed to him that one point in the Brazilian method of evaporation was that antiseptic was used in the smoke, and here no antiseptic whatever was used, and the consequence was that we got tacky rubber, &c. It was possible that if an antiseptic were used, we could go on with the present method instead of the evaporation method. It was a difficult and intricate subject and one of great interest, and he was sure it was a very important one. There was a good deal of rubber turned out in Africa, but he did not think it would make any difference in the market for some years to come. He would like to mention in regard to *Funtumia* rubber that it was peculiar in this way, that it did not grow here and there as rubber in Brazil, but it grew in patches, and it was quite possible, as he knew himself, to find it growing in certain parts 200 or 300 trees in the acre; where trees grew in aggregations and batches, and in very large quantities, it is merely a matter of opening these patches containing grown trees, and there having ready-made plantations.

MR. WRIGHT :—Regarding the point of the difference between rubber preparation in the Amazon and our district; in the wild districts the water, proteid and resinous matter is included and antiseptic added. Inthe plantation we try to remove part of the water, the proteid matter and the resinous and do not even add antiseptic.

MR. BAMBER :—Perhaps we remove a little too much from the rubber. If other rubbers contain all this proteid and resinous matter and give better results, I do not see what we gain by removing two or three per cent. of resin and proteid matter, and at the same time lose in weight. We certainly want absolute purity in the factory. I think a rubber factory ought to be kept as sterile as the best dairy, because I have seen how tackiness can start from inoculation. I have been able to inoculate a good biscuit from a tacky biscuit after sterilisation, and there is no doubt that bad and weak rubber is often due to inoculation. This can be prevented by having everything in a sterilised condition. Often one sees a layer of proteid and sugar matter left around the buckets, and there is nothing that will encourage the growth of bacteria like this. I think that every precaution ought to be taken to see that the implements or utensils used for collection or manufacture should be practically sterile.

CAOUTCHOUC IN PURE LATEX.

H. E. THE GOVERNOR (to Mr Wright):—Your assumption of the amount of land that will produce a given number of tons of rubber was based, I presume, upon the amount of caoutchouc that has been extracted in the latex up to the present Assuming as a fact what we have heard—that apparently with an increased flow of latex you may have a decreased amount of caoutchouc,—of course, it would affect your estimate as far as the amount of land necessary to produce a certain amount of caoutchouc is concerned.

MR. WRIGHT :—My estimate was ¾ lb. plantation rubber per tree per year, not so much latex. The rubber itself is the dried product. We may collect varying quantities of latex according to the climate and other conditions, but this does not affect the yield of dry rubber to which I refer.

H. E. THE GOVERNOR :—Am I to understand from Mr. Bamber that in certain trees you have tapped, we will say last year or the year before, a certain amount of caoutchouc has been found in the latex? This year, in extracting from that tree, a smaller proportion is found in the latex. Are we to assume that the quantity of latex is increased, but the amount of caoutchouc is constant?—or are we to assume that the amount of caoutchouc from the tree is less in the later tapping than it was in the original tapping?

Mr. Bamber :—I think the amount of caoutchouc at present is practically permanent, but the amount of water in the latex has largely increased as you see in the wound response.

H. E. the Governor :—That leaves the amount of caoutchouc constant.

Mr. Bamber :—If we started some years ago with 32 per cent. of caoutchouc, and we now have 10, 15 or 20 per cent., what is it going to be in a few years? Are the trees going to keep on increasing the amount of latex so as to keep a constant quantity of caoutchouc?

H. E. the Governor :—Yes, that is the question.

THE ACREAGE UNDER RUBBER.

Mr. James Ryan :—I wish to say a few words on this question of acreage. There are two difficulties with which we have to contend. One is the possibility of overproduction, but the greatest danger in front of us is that all this rubber will not come in gradually. The planting has been done so rapidly that we will hurl on to the world very possibly in the space of three years—which three years, I take it, will be from 1910 to 1913—we shall hurl on the market this enormous quantity of cultivated rubber, which I estimate will be quite double the present production in threel years. The world cannot instantly absorb such a quantity without a severe dislocation of price. We have seen it in the case of our tea and in the over production of cinchona. I remember in one year alone Ceylon exported, without any warning—or with only such warning as we are giving here to-day—four times the world's consumption. What was the result? Quinine received such a blow as it has never practically recovered from. We knocked the retail price of quinine down from a guinea or 24s. to a shilling. The wholesale price touched as low as 8 d. Bark became practically valueless. In tea the moment we exceeded the world's demand by 10 per cent. we knocked down the world's price by 25 per cent. I have talked with political economists on the matter, and they tell us the ratio is incremental, and we must bear this in mind and take time by the forelock and introduce our rubber into fresh markets before the crash comes. I have gone very carefully into these figures with Mr. Herbert Wright, and I think his figures are rather an understatement than an overstatement of the dangers we have to face. I may say that the information he has given to me is that for the 1,2000,000 acres at the rate of a ton to 20 acres, which is necessary to produce 60,000 tons of rubber, the land is already planted and within five or six years from this date it will produce rather more than less the amount of rubber Mr, Wright gave us to-day. It, therefore, behoves us all to use our commercial prescience and without being optimistic or pessimistic approach it with the eye of ameliorists and face our enemies and be ready to meet them well prepared (Applause.)

DR. WILLIS ON BLOCK RUBBER.

Dr. Willis, illustrating his remarks with a large block of fine hand cured Para exhibited in the show, said he would like to call attention to the block of Para rubber in the show, as it came from the Amazon. When it was cut, it was quite white through the centre. It was rapidly blackening now. It would be seen that the rubber was quite damp. That, as it stood, was exactly like a Ceylon biscuit freshly taken out of the roller. There was no dry rubber in that block like the biscuits they sent home. If they rubbed their finger on this rubber and smelled it, they would readily recognise the smell of creosote, and it seemed to him a question worthy of consideration whether they ought not to try the effect of blocking their rubber. If he might hark back, they made biscuits first in their department in 1899. The methods used then were those used now. They prepared the rubber with acid which nearly everyone used now, and they also put in a small proportion of creosote. The creosote did not mix with the latex, but it was quite possible to do it. If they

mixed creosote with alcohol, ten of the former to one of the latter, and then added a few drops of latex the creosote mixed completely, and the result was the complete antiseptism of the rubber. There were biscuits lying in the museum at the gardens eight years old as good as ever. There was hardly any mould on them except a little that could be rubbed off with the hand. That rubber from the Amazon was quite damp. He thought it contained 15 per cent. of moisture, whereas in Ceylon rubber there was only about one per cent, and here was rubber in perfectly good and sound condition taking 15 per cent. of moisture and creosote. The Amazon rubber seemed to him much more springy than the Ceylon rubber. If they took a Ceylon biscuit and pulled it out, it would spring back a certain distance and then creep back slowly into the original shape. If they took a piece of South American rubber, it sprang back at once. That was one of the.

COMPLAINTS AGAINST CEYLON RUBBER IN THE LONDON MARKET.

that its quality was not quite good enough for the finest kind of work, and they should try to improve it in that respect. He suggested that some of the proprietary planters might try as an experiment preparing rubber with creosote and preparing it in blocks before it was quite dry. It was quite possible they might get better results, and he thought it would be well worth the while of some proprietary planter to try that. With regard to the wild rubber His Excellency asked if there had been any figures recently from South America, but he was afraid tapping was not done there with sufficient care for that. In South America they simply made a big gash on the tree with an axe and stuck on a cup with mud. In South America, however, the latex ran for a longer time than in Ceylon in a fluid condition, and Mr. Parkins, who worked in Ceylon in 1898, was of opinion that the latex was of a poorer quality than the latex of the West. He found a large percentage of latex in the old trees at Henaratgoda, and he was of opinion from the figures that probably on the whole the latex in South America was rather weaker than that in Ceylon.

RUBBER PREPARATION ON THE AMAZON.

H. E. THE GOVERNOR ;—Is this sample of rubber prepared wlth creosote, or with the smoke of a particular nut ?

Dr. WILLIS explained that the preparation of this rubber was done in the following manner :—The man had a large bucket of latex in a liquid condition. He had a paddle in his hand. He dipped the paddle in the bucket and held it over a flowerpot in which he had nuts of a certain palm burning. He revolves the paddle until the latex stiffens and then dips it in the latex again, &c. Mr. Parkins analysed the smoke of that nut and found it was a fairly clear smoke, and he found the smoke on burning the nuts contained a large quantity of acetic acid and creosote, and it was on that result that Mr. Parkins based his method for the preparation of Ceylon latex. He based his method on a long series of experiments. He did not know if there was anything else in the smoke. Its marked feature was that it contained a quantity of acetic acid and a fair amount of creosote.

Mr. RYAN :—In continuation of Dr. Willis's remarks, the acid to which the character of this smoke is due is a crude form of acetic acid. Just as fusel oil is the foreshot of whisky, so this acid is really the cheaper form of pure acid we are now using, and it might be a moot point whether it were not better to use this pyroligneous acid instead of acetic acid. Perhaps before the end of the Exhibition we shall have some data to lay before youupon that point.

THE MARKET VALUE OF CHEMICALLY PURE RUBBER.

Mr. CARRUTHERS said in connection with that matter it might be interesting if he mentioned that some nine months ago a prize was offered in the Federated Malay States for the most chemically pure rubber of any kind that could be prepared

At the time a great many planters were of opinion that what they wanted to make for was chemical purity. It was possible—and he thought, indeed, probable—that they ran that hare rather too fast. He sent sixteen samples submitted to Prof. Dunstan and Mr. Gray, who was a partner in Silvertown Rubber Works, and who had a good knowledge of the chemistry of rubber. The samples were in varied forms—many in crêpe form, some sheet and some biscuits. The advocates of crêpe at that time claimed that by the continuous passing of the rubber through the rollers they got a greater chemical purity than was to be found in sheet or biscuits, and they hoped that their rubber could get the prize, and so crêpe would be acknowledged the best. However, when the samples came back, it was found that in regard to chemical purity crêpe came sixth, so that passing through the rollers did not give rubber chemical purity. But what was chiefly interesting about the matter was that these samples were also submitted to Mr. Gray for his opinion as to their value for the market, and those which were most chemically pure would not, in his opinion, fetch the highest price in the market; so that it was more than possible that as Dr. Christy and other speakers had said, they were taking something out which it would be of advantage to leave in. However, if that conference began to make men think of a method whereby simply by using creosote, which was the simplest way of imitating the smoking of Brazil, they could cure in such a way as to make fibre or nerve or whatever they might call it, so that they might get the highest price for their rubber, it was a step in the right direction. In regard to the figures Mr. Wright and Mr. Ryan gave, the word "alienated" was used for land planted. As far as the F.M.S. were concerned, if they had taken the figures of alienated land, that meant 20,000, 30,000 or 40,000 which was merely taken up, and which it would be impossible to plant for many years. If they had 10,000 acres, it would be absolutely impossible to plant it all within ten years, so that if the figures referred to alienation they must be discounted very largely if they wanted to use them for the purpose of considering the amount of rubber produced.

Mr. Wright:—In calculating the figures representing the districts to which Mr. Carruthers referred, I may say that in working out these figures, we accepted those Mr. Carruthers gave in his last annual report (laughter) which is 30,000 merely—which is very little for your place, and may be exceeded before the end of 1906.

Mr. Carruthers:—Oh! (laughter) I stand corrected. I may say I did not follow them very carefully, but I must say a quarter-of-a-million acres rather staggered me. I did not think my figures assumed such large numbers as that.

Mr. Wright:—The 250,000 acres cover the whole Indo-Malayan region. As a matter of fact the figures gave us nearly half-a-million alienated, but we only want to take into consideration the minimum, 250,000, planted in 1906, to come into bearing in 1913. It is the minimum you can possibly allow for.

Mr. Carruthers:—The question is whether these figures are correct.

THE SALE OF UNSUITABLE LAND BY GOVERNMENT.

Col. Byrde said he had been asked to read a paper by Mr. F. C. Roles who had seen a copy of Mr. Wright's lecture, and based his remarks on them.

Mr. Roles wrote:—While realising that it is easy to prove anything by suppositional figures, I agree with the lecturer that it is wise not to anticipate a reduction in the world's output of wild rubber. Threatened industries die hard; and the output of plantations cut out of rubber forests and worked under European supervision (as for example Dr. Cuthbert Christy's Uganda Concession) has to be reckoned with, though it will presumably be classed by the trade as plantation and not as wild rubber. It will be free from impurities, and will help the Congo stuff with percentages of impurities very much higher than the Brazilian standard

which the lecturer has naturally taken. As to the demand for rubber, I would give my imagination greater rein. With the inevitable annual, but gradual, reduction in price, whole branches of industry, the ground plans of which are in existence, will start into being. But whether the demand will, in 1917, be 120,000 tons or 180,000 tons, no one can dogmatically say that no more land than is at present alienated should be disposed of for rubber in either Ceylon or the Malay Peninsula, and least of all in South India. The Ceylon Government will continue to put to auction, as quickly as it can, land that has been applied for; and the Federated Malay States authorities seem to have no fear that too many of their agricultural eggs are going into one basket, though they are dependent for much future revenue on the permanency of the industry. I wish, however, to record one suggestion applicable to the State policy in Ceylon, when large blocks of land, selected by Government itself are offered at auction. In the famous sale of October last, fern land went up with the rest. In the notice of sale had appeared the words "Said to be suitable for rubber." This statement reflected the speculative spirit of the period, but in future the State might protect its own, the planter's and general investor's interests much better. It is an economic blunder to sell land that is unsuitable; and I urge that when it has blocked out acres it is prepared to dispose of, the Government should engage recognised planting authorities to inspect the land, and, accepting their dicta, sell for rubber only the acreages they have passed suitable for rubber. The fees paid to these experts would be more than recovered by the better prices the land would secure; and the ultimate advantages would be far-reaching. The Government would not be even remotely a party to land being planted that would be incapable of yielding, say, ½ lb. of dry rubber per tree per annum. Here is tangible opportunity to protect Ceylon's good name. In the booms of coming years it will be impossible to always prevent unduly heavy profits by middlemen in floating produce companies on the London market; but we can do something now to prevent that greater disaster which can overtake the Colony's reputation if properties which can never properly yield are foisted on to the investing public.

Mr. Wright subsequently stated he was glad that Mr. Roles agreed with some of his suggestions, and that he realised that scientific people and methods are being employed in the extraction of rubber from the wild forests of Africa. Mr. Wright believed that the same applied to exploitation in other countries, and will continue as long as the present high prices are paid for the raw material. The suggestion regarding land selection for future extensions is, Mr. Wright believes, a very sound one. Persons who have already planted or obtained land for rubber planting, have very bright prospects before *them*; but those who secure and plant their land during the next few years, must conduct their operations on scientific lines if success has to be guaranteed. Those estates which have been best planted, and those soils which have the best physical and chemical properties will naturally do better than the rest when the struggle sets in. It is, Mr. Wright believes, conceivable that selected land not yet planted may give better results than some patches of poor soil already in rubber. With regard to the figures Mr. Wright gave, he wished it to be clearly understood that he was by no means wedded to them, and that he was fully conscious of the many developments possible in the rubber industry of the future.

Dr. Christy remarked, in regard to the lump of rubber shown by Dr. Willis, that an interesting point in connection with it was that one thin film was placed on top of the other, and eventually by the time that it was ready to go to the washing, it was not only a lump of rubber but an automatic rubber press as well. He meant that each film pressed on the next film, so in producing this hard block of rubber you would get—not only a great amount of power, but equally pressing power which exercised a continual pressure.

Mr. BAMBER said there was one other point. With regard to the question of blocking rubber in a wet condition, he did not think it would be quite a wise thing. The amount of moisture left would be a very variable quantity, and he thought the manufacturers at home would be a little doubtful about the rubber. They would find there was a bigger loss in some cases than in others, and at present Ceylon had a name for losing very little in the washing and curing process, and anything which made the quantity of water uncertain, might interfere with the demand.

Mr. R. MORISON :—After the application of creosote, will Dr. Willis admit that drying would do no harm ?

Dr. WILLIS explained that he suggested that merely as an experiment for proprietary planters to try in order to see what result they would get. Probably the damp would make the quantity of rubber uncertain, but it was not difficult to devise machinery to get over that difficulty. It should be quite easy to devise machinery which would make the amount of water in a particular block of rubber fairly uniform.

Mr. C. DEVITT :—That block of rubber is dried in layers, but it has water in between each, and it would never do to mix creosote with the Ceylon rubber in making one block. It would be wet and also not properly cured. In this block each layer is dried, but it has got the water in between. It is not one mass. It is in hundreds of different layers, but in a plantation like Lanadron the block produced is all one piece. If you mixed creosote with the latex, you could never dry it in one mass. You would have to smoke each layer just the same as in the Amazon block.

H.E. THE GOVERNOR :—Mr. Wright has given us a very interesting lecture, and I think the discussion has been of very great value. I think we have to thank Mr. Wright for the great care with which he has prepared his lecture, and also the gentlemen who have spoken on the subject for the information they have given you, gentlemen and planters, and to the work in the future. (Applause.)

THE USE OF GUAYULE RUBBER.

Particularly at the present time any material which can satisfactorily replace rubber in a mixing is a substance which every manufacturer would welcome. If this substance is a genuine rubber, and which can be had at low price, it is quite natural that the interest and curiosity of most manufacturers should be aroused. So far as Guayule rubber is concerned, its friends put it forward as a rubber which can satisfactorily take the place of many medium grade rubbers, and also replace to some extent in many mixings the use of higher priced materials. To get good results, however, the Guayule rubber must be very closely studied as it differs in its conduct from most rubbers which manufacturers are in the habit of using.

There are, on the other hand, many firms who have tried Guayule rubber experimentally when it was first introduced, and who are of opinion that its use is detrimental. So far as we are concerned personally, we have known of manufacturers who have made a success of Guayule, and of others who have failed to use it with any degree of satisfaction. We are bound to confess, however, that the latter used Guayule, not as a rubber which required special handling, but very much as though it was a substitute for a low grade rubber, while the former had spent a considerable time in making lengthy experiments in cleaning the rubber, and as regards its vulcanizing qualities.

The present article is not so much our own opinion of Guayule as the record of an interview with Dr. Werner Esch, who has done a very considerable amount of work on Guayule, and who was selected by Messrs. Riensch and Held of Hamburg

(the European Agents of one of the largest Guayule rubber producing firms in Mexico, the Companhia Explotadora Coahuilense, Parras) to come over to England and demonstrate to the manufacturers here that Guayule rubber possesses qualities which fit it for the manufacture of many grades of rubber goods, and these not at all inferior ones. While the opinions of Dr. Esch in this connection might not be taken as unprejudiced, since his mission was to prove the case for Guayule, yet it is only fair to state that for a long time back, without any material consideration which would affect his judgment one way or another, Dr. Esch has been active in his advocacy of Guayule, as his articles in the technical press can demonstrate.

In our interview with Dr. Esch, he pointed out that it was a curious fact that Guayule, the cheapest of all genuine raw rubbers, was until recently unknown to many English rubber manufacturers. Some had been reading about this rubber; some had seen samples of it, but altogether there were only two manufacturers who knew how to make profitable use of this cheap raw material.

The reason why Guayule rubber was first of all introduced to Germany had its origin in the fact that the Germans first discovered it, and even yet mainly German-Mexican firms do the business in this rubber. From the beginning Dr. Esch has been interested in Guayule, as he had the conviction that useful rubber goods could be manufactured of this rubber, and he used all his influence to extend a knowledge of this rubber.

In spite of unfavourable criticism, Dr. Esch states that he stood his ground, and now no expert doubts any longer that Guayule belongs to the class of genuine rubbers, and hundreds of tons of it are now used in large rubber works.

Although the period of its introduction has not been very long, Dr. Esch stated that there are now used hundreds of tons of Guayule rubber in the United States, and that the Companhia Explotadora Coahuilense, in Parras, Mexico, alone has, to his knowledge, sold in the last few months, say 600 tons.

At the beginning the attempts of several manufacturers to use Guayule resulted in failure, but these failures, according to Dr. Esch, are not difficult to explain, and the mistakes they made can be easily avoided. Guayule is a very peculiar product. It cannot be treated in the same way as Para or other kinds. The small Guayule bush does not contain latex, as do other rubber trees, but rubber already of a rather consistent kind; and that is the reason why the collection of this rubber is a very peculiar one. The Guayule rubber imported from Mexico still contains wood fibre. If one tries to remove this fibre, as in the usual way by washing machines, one never will get at the end a pure rubber. Through the pressing and squashing of the washing mill this wood fibre is forced into the rubber, which, by this time, is getting softer and softer, and a real removal of the fibre seems impossible. If the rubber is hung up in thin sheets, as the other kinds, to dry, it will become apparent that air does not dry it. If one makes thicker sheets in order to avoid the tearing from the sticks, it will not dry completely at all.

Very often Dr. Esch has found in Guayule rubber washed and dried in this way alkali residues, which still remained in the rubber, and from the alkali which is used in the usual Mexican treatment of the Guayule shrubs. In all such cases the use of Guayule rubber which has gone through these operations has the disadvantage of making the goods porous.

It has been Dr. Esch's endeavour to show the manufacturer who did not know how to use this rubber how to treat the raw material in order to remove all impurities, and, on the other hand, how to use it in the manufacture of useful rubber goods. In this method the old wash-hollanders can be used, as they cut the Guayule in sufficiently small pieces without the rubber undergoing such a deterioration as in the washing mills. By heating the water in the wash-hollanders the Guayule expands, the particles lose their adherence, and in this way the wood fibres are freed and drop to the bottom. In just the same way all other impurities are removed by the hot water, which cold water would not do so easily. Those who do not possess a washing hollander will require to cut the rubber into small pieces in another way. It can be done, for instance, by cutting the wet Guayule with a machine the same as is used in mincing meat, and then throwing it into hot water.

After this treatment the Guayule, now in small pieces, requires to be washed in cold water and then spread out on a wire netting and dried in dark rooms at a temperature of 30 to 40 degrees.

Dr. Esch is confident of the fact that the product so obtained is good enough even for making ebonite combs. He went on to say that there had been some mixtures put at his disposal which showed (according to the opinion of experienced working managers) that a vulcanite comb mixture, consisting of 2—3 Guayule and 1—3 Para, was apparently, at least, just as good as an analogous mixture of 2—3 Para and 1—3 Guayule. When he showed these samples in England to some experts, the first-mentioned mixture was always recognised as the best one, especially on account of the beautiful dark gloss. It is obvious that the Guayule, by virtue of its physical qualities, is exceedingly fit for use in the manufacture of many classes of rubber goods.

Dr. Esch stated that he knew of three rubber shoe works which use plenty of Guayule rubber, with very satisfactory results. Combined with mixtures, which are dry through containing plenty of rubber waste, etc., Guayule makes a good compound. One thing, however, has to be carefully considered in connection with compounds containing Guayule rubber, namely, the slow vulcanising and the resin contents of the Guayule. These two facts cause the inertia of the Guayule in the vulcanisation. Guayule belongs to the class of very slowly vulcanising rubbers, and these classes of rubber (as well as the ones vulcanised by steam) require an addition of heavy calcined magnesia.

Regarding the extended use of the ingredient, Europe is away ahead of Britain in this matter.

Although the magnesia added to these mixtures seldom surpasses 5 per cent., the leading Continental rubber and cable works use tons of the heavy magnesia. In order to avoid misunderstandings, Dr. Esch states that the mentioned limit of 5 per cent. heavy magnesia is available only for the soft rubber goods, and as to certain ebonite goods, for instance, packing sheets, etc., higher additions of magnesia are required.

Dr. Esch explained that as regards any further information that might be desired with regard to Guayule, he would be happy to furnish it to any reader of the Journal. He also stated that samples of Guayule, of any size, could be had from the firm already named in this article. In these days of fluctuating prices it is not always advisable to give price, but in order that comparisons may be made by any readers unacquainted with the price of Guayule, it might be stated that in small quantities it cost about 1s. 9½d. per lb. f.o.b. Hamburg, and in large quantities 1s. 6d. per lb. f.o.b. United Kingdom. The losses in washing can generally be taken in at about 25 per cent.—*The India-Rubber Journal.*

A Rubber Tapping Demonstration at Henaratgoda.

BY HERBERT WRIGHT,

Held at Henaratgoda Botanic Gardens, September 25th, 1906.

AN INTERESTING DAY AMONG OLD RUBBER TREES.

Mr. Herbert Wright, Controller of the Government Experiment Station at Peradeniya, delivered a lecture and gave practical demonstrations of tapping in the Henaratgoda Botanic Gardens before a large gathering of Ceylon planters, Delegates to the Rubber Exhibition, and visitors from the Federated Malay States, Straits and South India. On arrival at the Gardens, Mr. Herbert Wright delivered a brief lecture, giving the results of his experiments during the past year. He then conducted the party round the gardens, and showed them the various trees from which these results had been obtained, making explanatory statements, answering questions, and giving practical demonstrations throughout. It is safe to say that never before in Ceylon has a year's scientific work been put to so close a test and scrutiny as on this occasion; and it must be gratifying to those concerned to know that the comments of critical practical planters from the Malay Peninsula and South India were highly flattering —one prominent Indian visitor enthusiastically describing the day's proceedings as the most interesting and pregnant with information, of a series of phenomenally interesting and informing lectures and demonstrations. The visitors were much impressed with the elaborate character of the experiments in progress and the general excellence of the work shown on the trees.

Among those present were :—Mrs. Ryan, Messrs. P. M. Parkinson, Reinhart Freudenberg, C. K. Smithett, Hon. E. Fielding, Messrs. C. G. Devitt, James Ryan, Jas. P. Dove, P. W. E. Watts, Alex. L. Baines, R. J. Booth, J. B. Tennant, D. S. Ferguson, T. Jones, C. Leslie Devitt, G. A. Greig, F. G. Ballard, C. M. B. Wilkins, F. W. Byrde, C. W. H. Duckworth, W. L. Hutchinson, J. Cameron, R. L. Proudlock, T. P. Simpson, T. B. Campbell, R. Huyshe Eliot, H. Zacharias, J. C. Forbes, A. Lehmann, H. M. Devitt, E. M. Coventry, S. Brett, J. S. Patterson, Alex. Fairlie and Col. Ingouville-Williams.

THE LECTURE.

Mr. HERBERT WRIGHT—after the party had taken their places on seats arranged near the Laboratory—said :—

GENTLEMEN,—You have been invited to Henaratgoda in order to see the parent Para rubber trees in Ceylon, and to observe the general characteristics of a small but somewhat typical Para rubber forest. As you are aware, the plants were sent from Kew in August, 1876, and since that time seeds and plants have been sent in thousands to almost every part of the tropics where rubber plants are likely to grow. I know there exists a friendly controversial spirit between officials in the Straits,—and perhaps now in the Federated Malay States,—and Ceylon, as to the origin of the Para rubber plants in the Malay Archipelago ; but we are certain of one thing, and that is, that plants were sent to the Straits from Ceylon in 1877, though their ultimate fate is somewhat obscure. The climate at Heneratgoda is a little warmer and more moist than that at Peradeniya, and the results obtained up-to-date lead one to suggest that the Heneratgoda climate is perhaps more suitable for the growth of *Hevea brasiliensis.*

RANGE OF VARIABILITY.

Before going through our series of experiments, I may perhaps be permitted to make a statement which is warranted from our past experiences. Visitors to Henaratgoda and the Experiment Station must clearly understand that up-to-date results are given only to add to the sum total of our knowledge on the various points investigated, and not as results to be expected in the future or on the average estate.

The results obtained and published in Ceylon should be compared carefully with those obtained elsewhere, and if other countries will only respond as freely as Ceylon, the Malay Peninsula and India, in giving records of work done, knowledge of the highest importance to the rubber industry will soon be in our possession. The results tabulated for your information to-day are of interest since they show what has been obtained by experiments on every section of the tree, from the base to a height of nearly fifty feet. They are at the best only fragmentary and must not be accepted as the standard by means of which probable future yields can be calculated and checked. People are only too apt to regard a single year's results as something which will serve as a guide for, and stand the test of, the future; but I am sure that if the friends who visit these places were only in charge of scientific experiments for a few years, they would realise that the main point of interest in all such work is the variability of the results obtained. In all such experiments it is first necessary to determine the range of variability, and from that to calculate the error to be allowed in all experiments.

HIGH TAPPING RESULTS.

It will not surprise many of you to learn that the highest yield of rubber has been obtained from trees tapped from the base to fifty feet; these high tapping experiments were modified and worked on such a plan that the yield has now totalled to about 15 lb. of dry rubber per tree in eleven months; there can be but little doubt that if necessary, at the sacrifice of the tree, three times that amount could be obtained within one year. The cortical stripping necessary to give such a high yield, within one year, would in all probability kill the tree. You will notice that high tapping necessitates two or three coolies per tree per day, a fact which is of some interest to those planters who speculate on their future yields from parts of the stem above 6 or 10 feet.

LATEX WITHOUT RUBBER.

There is a very curious phenomenon to be recorded in connection with the tapping of the higher parts of old trees. We all know that when a Para rubber tree stem has a basal circumference of 20 inches or over, it yields normal latex—or at least a milky liquid which can be converted into rubber. The average circumference of the stems at the highest points, tapped at Henaratgoda, is not less than 30 inches, and the stems have usually yielded good latex. But on certain occasions the latex has been of such a nature that it could not be coagulated by any means whatever; and though this feature has been very erratic, it has been of much more frequent occurrence where high tapping has been carried on.

The following table shows the results for the last eleven months and the botanical significance of this curious phenomenon will form the subject of future remarks:—

Marks.	Height of tapping area.	Number of times when latex not coagulatable.	Number of times tapped.	Frequency of tapping.
A	5′-6′	0	91	Twice per week.
B	,,	0	93	do
C	,,	1	92	do
D	,,	2	270	Every day.
E	,,	0	136	Every alternate day.
F	,,	0	44	Once per week.
G	,,	0	11	Once per month.
H	,,	1	171	Every day from February 1st.
I	,,	5	257	Every day from October 1st.
L	30′	8	93	Tapped at irregular intervals.
M	6′-16′	1	95	Tapped at irregular intervals.
N	10′-20′	1	94	Tapped at irregular intervals.
O	20′-30′	2	94	Tapped at irregular intervals.
P	30′	16	78	Tapped at irregular intervals.
Q	50′	5	84	Tapped at irregular intervals.

SINHALESE FOR TAPPING.

There is another interesting feature in connection with our Henaratgoda tapping, and that is, that the whole of the work has been done by untrained Sinhalese coolies with the minimum European supervision. My visits to Henaratgoda have by no means been frequent, and beyond spending a couple of hours a month here, the work has been done entirely by Sinhalese villagers. I mention this in order to ward off the attacks of any critical visitor from other climes, who will naturally discover where the cambium has been cut only too frequently, and who must therefore feel inclined to suggest my decapitation as a fit punishment for the bad work done. However, you will see what can be accomplished by ordinary villagers, and how willingly the cambium of the Para rubber tree has tried to cover up the errors of the past.

YIELDS OBTAINED AT HENARATGODA.

Now I have pleasure in handing you the results obtained during our first year of experiment on a moderately large scale, and it is hoped that visitors from the Federated Malay States, the Straits and India will subsequently supply us with their records for comparison. Consider these results as tentative only, and be prepared to forget them if future work proves them to be misleading.

Groups.	Marks.	No. of trees.	No. of times tapped.	System of tapping.	Yield of dry rubber per tree. lb.	oz.
1	A	25	91	L S	3	5
	B	25	93	H S	2	8
	C	25	92	F H	3	0
2	D	5	270	L S	11	0
	E	5	136	L S	12	8
	F	5	44	L S	3	13
	G	5	11	L S	0	10
3	H	5	171	L S	7	7
	I	5	257	L S	10	10
4	L	1	93	F H	14	8
	M	2	95	F H	8	11
	N	2	94	F H	12	3
	O	2	94	F H	8	11
	P	1	78	L S	10	14
	W	2	84	F H	15	0

L S ... Long Spiral
H S ... Half Spiral
F H ... Full Herring-bone

Group 1 = A, B, C
,, 2 ,, D, E, F, G
,, 3 ,, H, I
,, 4 ,, L, M, N, O, P, W

THE SCOPE OF THE EXPERIMENTS.

In group number one (A, B, and C) the object has been to determine the relative value of different methods of tapping, the criterion being the yield of rubber per tree and per unit of excised bark. In group number two (D, to G) the object was to determine the yields obtainable when trees were tapped at certain intervals, varying from once per day to once per month. Group number three comprises trees tapped at the beginning of October and February respectively, in order to obtain some information on the relationship between the yield of rubber and climatic conditions. In group number four (L, M, N, O, P, W) we have been making experiments with a view to determining the yield of rubber obtainable from different parts of the stem.

At the close of the lecture Mr. James Ryan proposed a hearty vote of thanks to Mr. Herbert Wright for his lecture, remarking that no one had laboured more arduously in the field of rubber than Mr. Wright.

The vote was cordially carried.

THE DEMONSTRATION.

The party then left the "lecture room" and proceeded to the oldest trees in the gardens. The largest tree was measured by our enthusiastic visitors from India and the Federated Malay States, and showed a girth at 4 feet from the ground of 107½ inches.

Mr. PARKINSON remarked that the largest tree he had seen in the Federated Malay States was 103 inches.

Mr. WRIGHT :—What age?

Mr. PARKINSON :—22 years.

Mr. WRIGHT then pointed out a tree which had been tapped ten or twelve years ago. It was one of those, he said, which had given an average yield of 1½ lb. per year for a period of nine years. The bark of the tree had expanded and become very gnarled.

Mr. PARKINSON :—What system was it tapped on?

Mr. WRIGHT :—It was tapped on the V system. Of course, it could be done much better now than then.

Mr. DEVITT (Mysore) :—Could you tap it now?

Mr. WRIGHT :—Yes, but it would be difficult to get an even line on the bark.

Dr. LEHMANN —How long is it since it has been tapped?

Mr. WRIGHT —Not since Dr. Trimen's time, I think. [The trees that were then tapped, it was pointed out, were tapped rather high.] He said the trees in this group were all of the same age, but had not been equally treated. He did not think they would be able to tap higher than 6 ft., once they got their 250,000 acres in bearing.

Mr. PARKINSON pointed out that trees with thick stems such as these trees, branching off in forks at the top, were very liable to be split in two by the wind.

AN INTERESTING EXPERIMENT.

Proceeding round the garden the party came to a Para rubber tree with the top cut off. "You see here," said Mr. Wright, "rather a curious specimen of a Para rubber tree. We deliberately cut off the top of that tree to see whether it would throw out suckers and survive. The top was cut off in January this year, and you see the growth that has taken place since then. It was simply done as an interesting experiment. I am sorry to say it was misconstrued, and some people, who saw it here, went home and cut off the heads of their four-year-old trees—for which I got all the blessing."

Mr. DOVE :—I thought, perhaps, it was done on account of canker?

Mr. WRIGHT—No: just as an interesting experiment. We have not tried experiments yet to see what amount of latex it contains.

EXPERIMENTS IN TAPPING METHODS.

Mr. WRIGHT then proceeded to the trees, the results from which he had alluded to at his lecture. The trees marked C were those done by the full herring-bone. Then they had the half spiral in the trees marked B and the long spiral in A. The idea of these experiments had been to get some information regarding the value of each system of tapping, and as he had mentioned in his lecture the criterion in these experiments was the yield of rubber per tree and per unit of excised bark. These trees marked C had been tapped on 92 occasions, and the measurements taken on the spot showed that in 92 tappings they had worked through only 3 to 4 inches of bark approximately in the eleven months. The trees had been pared and pricked.

Tapping on that principle they had gone approximately round one-half of the tree, and a mean average yield of 3 lb. of dry rubber per tree. The long spiral gave 3 lb. 5 oz. and the half spiral 2 lb. 8 oz. That only showed the yield per tree, but they were trying to work out the yield per unit of bark excised.

Mr. Greig :—What angle is this tapping done at?

Mr. Wright :—The tapping was supposed to be done at an angle of 30 to 45. This system of tapping gives us three lb. of dry rubber in a year, and can be continued for 4 to 6 years.

Mr. Cameron :—Does that afford ample time for the bark to become renewed?

Mr. Wright :—I think six years would be ample time to allow for bark renewal.

Mr. Parkinson :—Starting on a smaller tree, however, your surface would not last so long?

Mr. Wright mentioned that the rate would be the same; and pointed out that the whole of the work had been done by Sinhalese coolies.

Mr. Parkinson :—And jolly well done, too!

THE HALF SPIRAL.

The party then proceeded to the trees marked B. They would notice, Mr. Wright remarked, that of the three systems they got the least rubber per tree in a given time by the half spiral system, and they had approximately gone round half to one-third of the tree. They could see on the tree where the Northway pricker had been used.

Mr. Parkinson :—Might I ask what tapping knives were used?

Mr. Wright :—The Bowman-Northway and Miller knives were used on the trees A, B, and C.

THE FULL SPIRAL.

Passing on to the trees marked A, Mr. Wright remarked that this was the full spiral tapping which, worked at the same rate, would go completely round the tree in three years. In some parts of the island they had adopted the spiral system and had completely stripped the cortex in a year. He thought it was a dangerous system to work. They could hardly expect the tree to stand being stripped of its entire bark so rapidly as once per annum.

THE EFFECT OF THE PRICKER.

Mr. Grieg :—When the pricker goes into the cambium, it raises a lump.

Mr. Wright :—The pricker does touch the cambium; but I have peeled away a large piece of bark, and have been rather surprised to find there was practically no bad effect, although I expected there would be. Very often, however, with the rotating pricker the coolies work up and down the cut macerating the whole of the tissues. I have not seen any very bad effects from the pricker when properly used.

Mr. Greig :—But does it not raise lumps? I have seen lumps raised by the pricker touching the cambium.

Mr. Wright :—You will see the effect of the pricker here. We find it an advantage to leave as much bark as possible on the tree, and reach the latex tubes by means of the pricker. I have seen a case where the paring was done very deeply, and where the cooly had gone very near, but not quite to the cambium; when the dry weather came, the bark peeled away, and the borers got in. You get it worse in Ceara than in Para, for—as you know—the bark of Ceara peels away much more easily.

A REMARKABLE STUMP.

Mr. Wright then led the party to a remarkable Para stump cut 3 feet or 4 feet from the ground and cemented over the top. "This," said Mr. Wright, "is rather an interesting old stump. It is another of the trees which were tapped lightly

on the V sytem many years ago. The principal part of the tree died down, and for the last three years the stump has been in this condition ; so I thought we would cover it up and see how many biscuits we could make from it. I may say this stump has never thrown out a leaf for over three years. This (pointing to the tapping mark) shows the difficulty of tapping over such an irregular surface. There is latex in it yet, and I think it is a remarkable fact that a tree stump, which has never thrown out a leaf for three years, should still give latex. Biscuits made from the latex of this stump are of good quality.

Mr. Brett :—Have you got any biscuits you have made out of this stump?

Mr. Wright :—Yes, they are here.

Mr. Parkinson here tapped the tree and latex immediately began to come. An exposed root was tapped by Mr. Proudlock and the latex flowed freely, while the wood looked quite fresh.

Mr. J. Sheridan Patterson asked Mr. Wright if the biscuits from this stump were as good as the rubber from other trees.

Mr. Wright :—In physical properties they seem to be the same.

HIGH TAPPING.

Mr. Wright then led the party to the trees where high tapping had been carried on. At the first tree, he said, tapping was going on from the base to thirty feet. There were only two coolies working on ladders. The tree, Mr. Wright said, was marked L in the calculations he had given, and had been tapped ninety-three times, and on eight occasions the latex could not be coagulated, which, of course, was rather interesting. In the ninety-three tappings it had given 14 lb. 8 oz. of rubber.

Mr. Cameron :—Over what period of time?

Mr. Wright :—From 26th September last year to the 30th August this year.

Mr. Wright :—In this series, L, to W, the idea has been to determine the weight of rubber obtainable from various sections from the base.

At the next tree three coolies were working on ladders, and Mr. Wright pointed out that they had not yet got half-way down the tree. In about eleven months eighty-four tappings have given 15 lb. of dry rubber. That was the maximum yield.

Mr. Cameron :—What is the height of the tapped area?

Mr. Wright :—About fifty feet. You will see that we have only gone round one-half or one-third of the tree, and I suppose it is no exaggeration to say that we could get 45 lb. if we were to peel the tree and we had the coolies to tap it. We have been tapping sometimes on alternate days and sometimes only once a week.

In reply to Mr. Parkinson Mr. Wright said the tapping had been carried on at irregular intervals on all trees marked W. All these trees were supposed to be twenty to twenty-nine years old. The rubber-yielding capacity of the bark, of course, varied as they went upwards. He had not yet had time to work out the yields according to the excision of the bark in the different sections of the tree. That tree on five occasions gave latex that refused to coagulate.

The party next examined the tree marked M which was being

TAPPED FROM 6 TO 16 FEET

approximately. The next trees were tapped ten to twenty, and the next twenty t thirty. The M trees had been tapped on ninety-five occasions and had given an average yield of 8 lb. 11 oz. from 6 feet to 16 feet. They wanted to find the yielding capacity of each action.

The N, O, and P. trees were then reached.

Mr. WRIGHT remarked that there they had the full spiral tapping from the base up to 30 feet in the trees marked P which had been tapped on seventy-eight occasions and given an average yield of 10 lb. 14 oz. per tree, and the number of times when the latex could not be coagulated was sixteen. That was the maximum number of times when the latex could not be coagulated.

Mr. PARKINSON :—Have you any reason to account for that?

Mr. WRIGHT :—It is very peculiar. The material seems to have the caoutchouc, but it does not appear to have the material for collecting it into one mass.

Mr. PARKINSON :—Has the latex been chemically analysed?

Mr. WRIGHT :—Yes, it has been sent to Mr. Bamber.

Mr. RYAN :—Have you tried evaporating it?

Mr. WRIGHT :—No, that would char it, would it not?

Mr. RYAN :—I do not think so.

Mr. WRIGHT :—It is very interesting. If you take a young stem you know you get a viscous substance that will not coagulate; but then that is only when the stem is a few inches in diameter; the part of this tree from which we got the uncoagulable latex must be 35 inches in circumference. The circumference of the narrowest part is much greater than that of six, eight or even some ten year old trees.

Mr. PARKINSON :—In Ceylon? (Laughter.)

Mr. WRIGHT :—I beg pardon, Federated Malay States. (Laughter.) I do not know how you can explain it. You would expect the bark to be normal when the circumference is so large.

Mr. WRIGHT next pointed out another tapping above 20 feet which had given 8 lb. 11 oz. with uncoagulatable latex on two occasions.

FREQUENCY OF TAPPING.

The visitors were then taken to the division of trees where experiments had been carried out to determine the frequency with which trees might be tapped with the best results.

Mr. WRIGHT explained that the trees marked D which were first viewed had been tapped up to 6 feet only, every day from September 25th of last year. They had been tapped on 270 occasions. The lines were originally 12 inches apart, and only on two occasions had they got latex which had refused to be coagulated. This had proved far too rapid a process of excision altogether. He would next take them to the other tree marked E with which he was making a comparison. The latter had been tapped on alternate days and had given 12 lb. 8 oz. in 136 tappings, whereas those tapped daily on 270 occasions had only given 11 lb. That was a curious result. In the daily tapping they had cut through the whole of the bark. If they studied the nature and origin of the latex tubes of Para rubber, they would find that the whole thing was a question of the time required for decomposition. They might cut the bark one day and find no latex. If it were allowed to remain a sufficiently long time for decomposition to take place, you finally obtained latex. Evidently by tapping daily you cut through the bark at too rapid a rate for the developing capacity of the laticiferous system.

In reply to a question, Mr. WRIGHT said they used the paring knife and the pricker alternately in each case. They saw there what they must expect if they tapped 270 times in eleven months. He would certainly not propose to tap the renewed bark under three or four years. One cortical stripping every four or five years was quite enough. They saw the effect on the bark. It was drying and was quite sound underneath.

RENEWAL OF BARK,

Mr. Ryan :—Are you in favour of dressing the bark of the trees with any preservatives?

Mr. Wright :—I do not see why you should do so. In special cases it might be useful.

Remarking upon the state of the bark, Mr. Wright said they saw there a sample of the work done by the Sinhalese cooly. They would probably see one or two cases where he had cut into the cambium, but he did not think there were many. He would like to know how it compared with work in the Federated Malay States.

Mr. Dove :—It is very good work.

Mr. Parkinson :—Very good, indeed.

Mr. Devitt cut into the bark of a tree which had been tapped daily and found that the renewed bark measured ¼ of-an-inch.

Mr. Wright :—That is very interesting. That has taken 12 months to this date to develop.

The party then examined trees which had been tapped on alternate days, and Mr. Wright said they would see that they still had approximately one-third of the original bark, which was the mother of all rubber, left after obtaining 12 lb. 8 oz. of rubber, against 11 lb. in 270 tappings in the other trees. Further, here they only tapped 136 times against 270 in the other case, so that the cost of labour was one-half. He thought personally that was the most interesting result they had obtained up to the present. He did not know whether the labour difficulty would permit them to tap on alternate days. Would it be possible?

Mr. Parkinson :—Yes.

Mr. Wright added that they had made experiments in tapping once a week and once a month. Coming to the trees which had been tapped once a week, he said from 44 tappings they had obtained an average of 3 lbs. 13 oz. per tree. Not on a single occasion did they obtain latex they could not coagulate.

On arriving at the trees that had been tapped once a month, Mr. Wright said they had tapped on eleven occasions and got 10 ounces of rubber, or ¾ lb. of rubber per tree approximately. They had now seen the trees tapped from once a day to once a month. If Mr. Parkinson's assertion was applicable to Ceylon, that they could tap on alternate days, the prospects were very favourable. These trees showed what they might expect, tapping at the rate of once per month. They might go on for ten or twelve years.

LANDOLPHIA RUBBER VINES.

Mr. Wright then took the visitors to see the Landolphia rubber creepers growing in considerable abundance in a part of the ground and spreading their vines all over the neighbourhood. On a thick part of one of the vines being cut, latex flowed more freely even than in Para rubber and coagulated rapidly.

Mr. Wright remarked that Landolphias grew only among jungle trees. They must have some tree upon which it could climb. The best method of extracting the latex was probably maceration. Those specimens were probably fifteen years old. The bark was fairly thick, and the rubber was very good in quality.

Mr. Proudlock said he got excellent rubber from it at Nellamore in 1903.

Mr. Wright :—Have you any idea of the rubber contained, say, in a cwt. of bark?

Mr. Proudlock .—I have the results tabulated. The percentage is very high—I believe from seven to eight per cent.

DEMONSTRATION IN THE TREATMENT OF LATEX.

After going through the plantation the party returned to the Laboratory where Mr. WRIGHT gave a brief demonstration in the treatment of latex. Mr. Wright said :—We had all heard lately about the difference in the physical properties between rubber obtained from five, six and thirty year-old trees. I have here samples from trees 29½ years. [The biscuits were handed round and tested and proved to be of excellent strength and resiliency.] These have all been treated with a little formalin. They are not smoked. We have now gone through practically every process at Peradeniya and Henaratgoda. You have seen the trees that have been tapped and got information regarding the yields obtained, &c., and you have seen every development at Peradeniya in the manufacture from the latex. There is very little of interest left to go over except to describe a few of the characteristics of fresh latex.

Mr. WRIGHT then experimented with a quantity of latex to ascertain the amount of acid required to coagulate. He remarked that the latex, as it came from the field, or as it is issued from the tree, was either neutral or a little alkaline. Mr Wright dipped some red and blue litmus paper in the latex and asked them to notice that the blue remained blue and the red remained nearly the same. It was almost a neutral solution. So long as it remained in that condition coagulation would not take place. If they wanted to effect coagulation they must either let the latex stand to allow the acids to develop or use some acid. Washing eliminated a certain portion of the acid added, but if they determined the quantity by means of litmus paper, he thought it would do away with a good many cf the objections that were put forward by people at home to the use of these reagents. The point was to add just sufficient acetic acid to neutralise the latex, until it was just on the turning point and then allow it to settle.

Mr. RYAN :—What proportion of acid?

Mr. WRIGHT :—You never know the proportion beforehand, because the composition of the latex varies very much.

Mr. WRIGHT then demonstrated with blue papers adding acid until they began to get red.

Mr. CAMERON :—May I ask what proportion of water is in the latex?

Mr. WRIGHT :—A very large proportion. Pure water makes no difference to the rubber. Many people have used impure water which has pre-disposed the rubber to tackiness.

Continuing, Mr. Wright said that in future their programme would be considerably changed. They had now arrived at the stage when they could despatch their latex to Peradeniya. Formerly the Foreman prepared the biscuits at Henaratgoda. Now their latex could be sent to Peradeniya and manufactured there so that they hoped to make good samples of rubber.

The Hon. E. FIELDING :—How do you preserve it on the way?

Mr. WRIGHT :—By the addition of ammonia or formalin.

The Hon. E. FIELDING :—Does it matter how much?

Mr. WRIGHT :—You soon get to know how much you want. It depends a great deal on the amount of water you add and acidity present.

Mr. PARKINSON :—Do you ever find that for a natural coagulation it takes longer when you have a large quantity of water?

Mr. WRIGHT :—I cannot say I have had that experience. Have you?

Mr. PARKINSON :—I have found it so, and I think you will find it so.

Mr. RYAN :—My experience is the same as Mr. Parkinson's.

Mr. Wright:—In some latices you coagulate by adding water—Funtumia, for instance.

The party then adjourned to the Resthouse where the Resthouse-heeper had prepared lunch. At the close, Mr. Herbert Wright, in a brief speech, prospected the health of the departing Delegates and visitors who were on the point of leaving by the down train. He was sorry they had to go at so early a date when they were just beginning to be interested in the subject of rubber cultivation and the problems involved. They in Ceylon hoped it would not be long before they came back to Ceylon again, and then they hoped to be able to give them a good show, perhaps, better than the one to which they had so successfully and effectively contributed. (Applause.)

The toast was cordially drunk with musical honours.

Dr. Lehmann in reply, said he was sure they all appreciated very much the kindness they had received while in Ceylon. They had seen a great deal and heard a great deal and learned a great deal. He hoped that some time or other they might have a Rubber Exhibition in South India, at which they would welcome the Ceylon men as heartily as they had welcomed them. (Applause.)

The departing visitors were then escorted to the station and seen off by the Ceylon men, cordial cheers being raised as the train steamed out of the station.

Block Rubber.

METHODS OF MANUFACTURE AND PREPARATION.

By Francis Pears, *Lanadron Estate, Johore.*

Seeing the attention this has attracted both at the Singapore Agri-Horticultural Show and at the Ceylon Rubber Exhibition, it would not seem out of place to fully explain the points in its favour and the details of its inception, as claimed by the makers. The prize "block" was manufactured on the Lanadron Estate of Muar, and the awards made by the Judges of both Exhibitions are fully confirmed by the buyers at home who value this method of preparation at 3*d.* per lb. higher than the best sheet or crêpe.

This will, of course, have the effect of inducing many planters to take up this method of preparation, and it is to be hoped that in doing so they will recognise that it requires good machinery, and that good "block" is not to be manufactured by immersing sheet or biscuits in hot water and hydraulic pressing. This would only imitate it in appearance and not in quality.

THE MANUFACTURE OF "BLOCK" BY THE LANADRON ESTATE

was conceived, in the first instance, as a means of turning out a rubber of standard uniformity in a practical manner, and one which would commend itself to those manufacturing rubber on a large scale; also to be a handy form for shipping and for storage at home. That this has been accomplished must be apparent to everybody. Added to this the improvement in the quality undoubtedly establishes this as the best means of manufacturing raw rubber hitherto employed. In considering any new methods referring to the treatment of raw rubber, there are certain axioms to be considered, the most important of which are the following:—

1. Uniformity.

2. The eradication, as far as possible, of organic, and the complete removal of inorganic, impurities in the latex.

3. Acceleration during manufacture to reduce to a minimum exposure to the air.

4. Small surface exposed after manufacture.

Rubber manufactured with a view to these principles, besides having the characteristics of a good commercial rubber, will give a system which would appeal to any one who takes an intelligent interest in this industry, and is desirous of establishing a factory organisation on up-to-date principles, and where manual labour will be reduced to a minimum.

COAGULATING LATEX IN BULK.

1. Respecting uniformity, the only way to accomplish this is to mix the latex and coagulate in bulk. It has been suggested that the latex from trees of different ages should be kept separate, but this proposition is not one that could easily be carried out in practice. It would be much better to start with the uniform standard; and if old trees really do give a superior latex, the product of the estate must gradually improve with age. It has not yet been proved conclusively that the older the tree the better the rubber, although there are many indications pointing to this conclusion.

WASHING THE FRESHLY-COAGULATED LATEX.

2. The eradication, as far as possible, of organic and the complete removal of inorganic impurities in the latex. The only way to effect this, as everybody who is interested knows, is to wash the freshly-coagulated latex on an ordinary washing machine, such as manufacturers use at home. In fact it is the only practicable method of reducing coagulated latex in bulk to uniformity of size, at the same time thoroughly washing every particle of rubber and removing all mechanical, besides a good deal of the organic, impurities. Tackiness, of which we have heard a good deal lately, and also mildew are a species of micro-organisms, and, although of frequent occurrence in biscuits, seldom if ever occur in properly washed crêpe. This is strong testimony to the fact that washing freshly-coagulated latex removes some of the organic impurities which are detrimental to the keeping properties of raw rubber. Whether in addition to this it may be advisable to impregnate the latex with some antiseptic, such as smoke (creosote), formaldehyde, etc., is a matter for further experiment.

VACUUM DRYING.

3. Acceleration during manufacture to reduce to a minimum exposure to the air. Despatch during manufacture can only be accomplished by accelerating the drying process, as hitherto this has occupied periods varying from a few days to as many weeks, with exposure all the time to the action of the air. Vacuum drying is the only practicable solution to this, as it combines two very essential points, viz:—rapidity, without any exposure to the air. By this means it is possible to dry the rubber in two or three hours. Exception has been taken to the use of vacuum dryers, as making rubber sticky, but this is only a matter of temperature which can be regulated mechanically. It is certainly rather a delicate operation and requires a man in charge who thoroughly understands the principles of the machine.

4. Small surface exposure after manufacture. After removal of the crêpe from the vacuum drier it is in a pliable condition in consequence of not being subjected to the hardening influence of air drying (oxidation). In this state it is easily pressed into any conveniently shaped "block," and the whole forms a perfectly homogeneous mass, hermetically sealed, with a minimum surface exposed to the air and light.

RUBBER CULTIVATION IN COLOMBIA.

The following letter is inserted as being of present interest, showing how widely this cultivation is being taken up:—

Bogota, August 31st, 1906.

To Sir Edward Grey, Bart., M.P.

Sir,—Since writing my despatch No. 41 of this series of June 28th last on the subject of the Rubber industry in this country, I have ascertained that some 80,000 plants of the Manihot Glaziowii (Ceara) species have been planted on an estate some three days' journey from this capital, and are now from six months to four years old. The owner informs me that he hopes to tap from ten to fifteen thousand trees this year, and that a sample which was recently sent to England was classed as high as the best Para. He further informed me that in various parts of Colombia the climate and soil appeared to be very suitable for rubber cultivation, but he was the only person who had yet tried it. The prospects of the industry were, he said, mainly dependent on the London prices, which, however, seemed likely to be remunerative for some time to come. This remark was no doubt induced by the wide-spread ruin caused in this country by the fall in the coffee market some few years ago.

I have since found that my informant was mistaken in believing that he is the only grower of rubber in Colombia, for the manager of another estate informs me that he is making experiments with Ceylon seed and has obtained promising results. I have heard, too, that there are planted rubber trees of six years' growth on an estate owned by a Frenchman near the Venezuelan frontier, a fortnight or three weeks' journey from here.

I should add that rumours have reached me of attempts to float companies for the cultivation of rubber somewhere in the vast department of the Cauca bordering the Pacific. It is possible that some particulars might be obtainable in London respecting these schemes if they really exist.

I have, etc.,

(Signed) FRANCIS STRONGE.

LONDON RUBBER MARKET.

London, October 12th.—At to-day's auction, 407 packages of Ceylon and Straits Settlements plantation-grown rubber were under offer, of which about 232 were sold. The total weight amounted to about 23 tons, Ceylon contributing about 5¾ and Straits Settlements nearly 17¼. There was a good market for all descriptions and competition was fairly general, though in a few cases sellers' ideas were not quite realised. Fine plantation showed little change in price, although bidding was hardly as brisk. A fine parcel of crêpe from the Bukit Rajah Estate realised up to 5s. 8d. per lb. Best sheet and biscuits sold at from 5s. 6d. to 5s. 7¼d., whilst good scrap generally made very firm prices. Plantation fine to-day.—5s. 6d. to 5s. 7¼d., same period last year, 6s. 2d.; plantation scrap.—3s. to 4s. 6½d., same period last year, 3s. 10d. to 5s. 1¼d. Fine hard Para (South American).—5s. 1½d., same period last year, 5s. 5d. Average price of Ceylon and Straits Settlements plantation rubber,—232 packages at 5s. 1¼d. per lb., against 259 packages at 5s. 5¼d. per lb. at last auction. Particulars and prices as follows:—

CEYLON.

MARK	QUANTITY, DESCRIPTION AND PRICE PER LB.
Doranakande	5 cases good darkish biscuits, 5s. 7d.; 7 cases good palish to darkish scrap, 4s. 5¼d.; 3 cases black scrap, 4s. 2d.

Tallagalla	2 cases	fine large palish to darkish biscuits, 5s. $7\frac{1}{4}$d.; 1 case good palish pressed scrap, 4s. $6\frac{1}{4}$d.
Taldua	2 do	good darkish biscuits, 5s. 7d.
Sirigalla	1 do	good palish scrap, 4s. 5d.
C.L. (in diamond)	2 do	darkish crêpe, 4s. $10\frac{1}{4}$d.; 4 cases little darker, 4s. 10d.; 2 cases thick darkish crêpe, 4s. 10d.; 2 cases palish and darkish to black crêpe, 4s. $5\frac{3}{4}$d., 2 cases pressed scrap, 4s. 5d. 1 case palish scrap, 4s. 5d.; 2 cases darker, 4s. 5d.; 1 case similar, 4s. 5d.; 1 case pressed scrap and rejections, 4s. $3\frac{1}{4}$d.; 2 cases inferior scrap, 2s. $10\frac{1}{2}$d.; 4 cases darkish crêpe, 4s. $10\frac{1}{4}$d.; 2 cases pressed scrap 3s. $11\frac{1}{4}$d. 1 bag rejections, 4s. $2\frac{1}{2}$d.
Gikiyanakande	2 do	good palish pressed crêpe in rolls, 5s, 5d.
Heatherley	1 do	fine pale amber biscuits, 5s. 7d,; 1 case similar, 5s. 7d.; 1 case fine pale pressed crêpe, 5s. 7d.; 2 cases good darkish ditto, 5s. $2\frac{1}{4}$d.; 1 case black pressed crepe, 3s. 10d.
Ellakande	1 do	palish to darkish biscuits, 5s. $6\frac{3}{4}$d.; 1 case darkish pressed crêpe, 5s. 1d.; 1 case black ditto, 4s. $2\frac{1}{2}$d.; 1 case similar, 4s. $2\frac{1}{2}$d.
Arapolakande	8 do	good darkish biscuits, 5s. 7d. 1 case dark scrap, 4s. 4d.
Kumbukkan	4 do	fine pale and palish biscuits, 5s. $7\frac{1}{4}$d.; 3 cases good darkish biscuits, 5s. 7d.; 1 case good palish to darkish pressed scrap, 4s. 5d,; 1 case good darkish biscuits, 5s. 7d. 1 case dark lump scrap and rejections, 4s. $4\frac{1}{2}$d.; 1 bag good pressed block scrap, 4s. $4\frac{1}{2}$d.
Udapolla	1 bag	good palish scrap, 4s. 4d.; 1 bag lump scrap and rejections, 4s. $0\frac{1}{2}$d.

STRAITS SETTLEMENTS.

MARK.	QUANTITY, DESCRIPTION AND PRICE PER LB.	
S.P. S. (in circle)	1 bag	lump scrap, 4s. 5d.
S.P. (in circle)	1 case	darkish sheet, and rejected biscuits, 5s. 6d.
Teluk Batu	14 do	good palish to darkish sheet, 5s. 6d. to 5s. $6\frac{1}{4}$d.; 4 cases palish pressed scrap, 4s. $5\frac{1}{2}$d.; 1 case black pressed crêpe, 3s. $7\frac{1}{2}$d,; 1 bag rejected biscuits, 4s. 2d.
Beverlac	4 do	palish to darkish scrap, 4s. $5\frac{1}{4}$d.; 3 cases inferior dark scrap, 1s. $10\frac{1}{4}$d.; 1 case dark lump scrap, 3s. 7d.
B.C.	4 do	fair pressed scrap, 4s. 5d.
B.C. A.	4 do	pressed rejections, 3s. 11d.
B.C. B.	1 do	darkish crêpe, 4s. $9\frac{3}{4}$d.
Brink	2 bags	darkish to black crêpe, 4s. $6\frac{1}{2}$d.
C.	1 case	rejections, 4s. 4d.
B. & C.	1 do	rejections, 4s. 4d.
P.R.	7 do	good palish pressed crêpe, 5s. 5d.
C.	1 bag	rejections, 4s. 4d.; 1 bag rejections from biscuits 4s. 4d.
S.R. Co	10 cases	dark pressed scrap, 4s. $10\frac{1}{4}$d.; 2 cases darker, 4s. $4\frac{3}{4}$d.
V.R.C.O. Klang F.M.S. (in estate mark)	15 do	fine palish to darkish scored sheet, 5s. $6\frac{1}{2}$d.; 1 case ditto darker, 5s. $6\frac{1}{4}$d.; 4 cases good palish pressed crêpe, 5s. 5d.; 13 cases darker, 4s. $10\frac{3}{4}$d.; 3 cases very dark, 4s. $4\frac{1}{2}$d.; 2 cases palish pressed crêpe, 5s. 5d. 4 cases darker, 5s. $1\frac{1}{2}$d.
G.U.L.A. (in diamond)	6 do	fine large palish to darkish sheet, 5s. $6\frac{3}{4}$d.
R R. (S. in diamond)	4 do	good palish sheet. 5s. $6\frac{1}{2}$d.
S.R. (S. in diamond)	2 do	good pressed scrap, 4s. $5\frac{1}{2}$d.; 2 cases pressed rejections, 4s. 1d.; 1 bag rejections from biscuits, 4s. 7d.
B.R.R. Co, Ltd.	18 do	fine palish crêpe, 5s. $7\frac{1}{2}$d. to 5s. 8d.; 5 cases darker, 5s. 2d.; 1 case darkish crêpe, 4s. 10d, 2 cases darker, 5s. $4\frac{3}{4}$d.
S.S.B.R. Co, Ltd. (in triangle)	1 do	good palish to darkish scrap, 4s. $5\frac{1}{2}$d.
B.U.E.	1 do	good palish to darkish thick crêpe, 5s. $3\frac{1}{4}$d.; 1 case darker, 4s. $11\frac{1}{2}$d.

LONDON, October 26th.—At to-day's auction, 266 packages of Ceylon and Straits Settlements plantation-grown rubber were under offer, of which about 131 were sold. The total weight amounted to about $15\frac{1}{2}$ tons, Ceylon contributing about 5 and Straits Settlements over $10\frac{1}{2}$. The quantity of plantation rubber brought forward was considerably less than during the last few auctions. Bidding generally was strong and prices showed a slight improvement. The highest figure was 5s. $9\frac{3}{4}$d. for an exceptionally fine parcel of crêpe from the Jebong Estate. Among the Ceylons some particularly good biscuits from Heatherly Estate realised 5s. $7\frac{3}{4}$d. Scrap also was well competed for and brought full prices. Plantation fine to-day 5s. 6d. to 5s. $7\frac{3}{4}$d., same period last year, 6s. $0\frac{3}{4}$d. Plantation scrap 3s. to 4s. $10\frac{3}{4}$d., same period last year, 3s. to 5s. $0\frac{1}{2}$d. Fine hard Para (South American) 5s. 3d., same period last year, 5s. 4d. Average price of Ceylon and Straits Settlements plantation rubber.—131 packages at 5s. $2\frac{1}{4}$d. per lb., against 232 packages at 5s. $1\frac{1}{4}$d. per lb. at last auction. Particulars and prices as follows:—

CEYLON.

MARK.		QUANTITY, DESCRIPTION AND PRICE PER LB.
Tallagalla	1 case	fine darkish biscuits, 5s. 7d.; 1 case good palish block scrap, 4s. 9d.; 1 case inferior mixed scrap, 3s. 10d.
Ambatenne	1 do	good palish to darkish biscuits, 5s. 7d.; 1 case darker, 5s. 7d.; 1 case good palish scrap, 4s. $10\frac{1}{2}$d.; 1 case darker and inferior, 4s.
Warriapolla	1 do	good pale biscuits, 5s. 7d.; 1 case fine palish biscuits, 5s. $6\frac{3}{4}$d.; 1 case somewhat darker, 5s. $6\frac{3}{4}$d.; 1 case darkish biscuits, 5s. 5d.; 1 case good palish pressed scrap, 4s. 10d.
Heatherley	1 do	very fine pale and palish amber biscuits, 5s. $7\frac{3}{4}$d.; 1 case darkish pressed crêpe, 5s. 2d.; 1 case black, 4s. 5d.; 3 cases very fine pale and palish amber biscuits, 5s. $7\frac{1}{2}$d.
Culloden	4 do	fine palish to darkish pressed crêpe, 5s. $7\frac{1}{4}$d.; 8 cases darker, 5s. 3d.; 1 case dark, 4s. $10\frac{1}{2}$d.; 1 case black, 4s. 8d.
M.A.K. (in diamond)	1 do	palish to darkish biscuits and rejections, 5s. 4d.
C. R. (R. W. & Co. in triangle) E.	9 do	fine large darkish sheet, 5s. $6\frac{1}{2}$d.; 2 cases palish pressed scrap, 4s. $6\frac{1}{2}$d.; 2 cases dark scrap and rejections, 4s. 2d. 1 bag darkish pressed scrap, 4s. $3\frac{1}{2}$d.
O.B.E.C. (in diamond) Kondesalle	5 do	fine darkish sheet, 5s. $6\frac{1}{2}$d.; 1 case pressed rejections, 4s. 5d.
Clontarf	2 do	good darkish biscuits, 5s. 6d.; 1 case darkish and dark crêpe, 4s. 11d.
Aberdeen	2 do	fine palish to darkish biscuits, 5s. $6\frac{3}{4}$d.; 2 cases darker, 5s. $6\frac{3}{4}$d.; 1 case fine pressed scrap, 4s. $7\frac{1}{4}$d.; 1 case thick rejections, 4s. 4d.
F.B.	2 do	pale to dark biscuits, 5s. $2\frac{1}{2}$d.; 1 case rejections from sheet, etc., 3s. 11d.
Wevekellie	1 do	palish biscuits, 5s. 7d.

STRAITS SETTLEMENTS.

MARK.		QUANTITY, DESCRIPTION AND PRICE PER LB.
B.R.R. Co., Ltd.	9 do	darkish crêpe, 5s. 1d.; 2 cases darkish mixed crêpe, 4s. $9\frac{1}{2}$d.
R.M.P. Ltd. (in cross)	7 do	good darkish to dark crêpe, 5s.
A. (M.C.I. in diamond) S.D. P.S.T.	1 do	good palish sheet, 5s. $5\frac{1}{2}$d.
B. do P.S.P.	1 do	darkish cut scrap, 4s. $5\frac{1}{4}$d.
C. do P.S.T.	1 do	fine pale sheet, 5s. 7d.
D. do P.S.P.	1 do	darkish rejected sheet, 3s. 9d.; 1 case darkish cut scrap, 4s. $3\frac{3}{4}$d.
E. do P.S.T.	1 do	palish to darkish sheet, 5s. $6\frac{3}{4}$d.
C.D. (M.C.I. 2 in diamond) P.B.	1 do	good darkish biscuits, 5s. 6d.
C.D. do P.S.P.	1 do	palish scrap, 4s. $4\frac{1}{2}$d.; 1 bag rejections from biscuits, 4s. 4d.
G.K.K.B. (in diamond)	1 do	fine pale sheet, 5s. $7\frac{1}{4}$d.; 1 case similar, 5s. $7\frac{1}{4}$d.; 1 case cut ball scrap, 4s. 2d.; 1 case rejections from biscuits and scrap, 4s. $4\frac{3}{4}$d.

P.P. S.B.	2 do	fine palish to darkish sheet, 4s. 7¼d.; 14 cases good darkish scrap and rejections, 4s. 7¼d.
E. B. & Co.	1 do	good pressed sheet, rejections and palish to darkish scrap, 4s. 6d.
Sungei Krudda	5 do	good palish to darkish scrap, 4s. 5d.
Jebong	5 do	fine pale crêpe, 5s. 9¾d. 2 cases darkish crêpe darker and heated, 4s. 9d.
S.S.B.R. Co. Ltd. (in diamond)	1 do	pressed scrap, 4s. 2d. 4 cases large palish to darkish sheet, 5s. 7d.

London, November 9.—At to-day's auction, 736 packages of Ceylon and Straits Settlements plantation-grown rubber were under offer, of which about 302 were sold. The total weight amounted to about 25¼ tons, Ceylon contributing about 4½ and Straits Settlements over 20¾. To-day's rubber sale was unusually heavy, the quantity of plantation offered being amongst the largest yet brought to auction in one day. Prices did not show any material change, crêpe and fine biscuits selling about up to late rates. There was a slight weakness in the bidding for some of the sheet; no block was represented in the auction. Good scrap again realised fair prices, as also some of the darker parcels of crepe. A parcel of fine pale crepe from Jebong brought 5s. 8½d., and amongst the Ceylon, two lots from Culloden and Heatherley each realised 5s. 7¾d. per lb. Plantation fine to-day.—5s. 6d. to 5s. 8½d., same period last year, 6s 0¼d. to 6s. 1¼d. Plantation scrap.—3s. to 4s. 7d., same period last year, 2s. 6½d. to 5s 0½d. Fine hard Para (South American).—5s. 2d., same period last year, 5s. 2d. Average price of Ceylon and Straits Settlements plantation rubber 302 packages at 5s. 3¾d. per lb., against 131 packages at 5s. 2¼d. per lb. at last auction. Particulars and prices as follows:—

CEYLON.

MARK.	QUANTITY.	DESCRIPTION AND PRICE PER LB.
Kumaradola	6 cases	good palish biscuits, 5s. 6¾d.
Taldua	2 do	good palish to darkish biscuits 5s. 5¾d.; 1 case good darkish scrap, 4s. 6d.; 2 cases dark scrap and rejected biscuits, 4s. 2½d.
Culloden	6 do	fine pale and palish amber biscuits, 5s. 7¾d.; 2 cases very fine pale and palish pressed crepe, 5s. 8¼d.; 8 cases darkish 5s. 3d.; 3 cases dark, 4s. 11¼d.
Nikakotua	3 do	darkish pressed crepe, 5s.; 2 cases good palish to darkish cloudy sheet, 5s. 5½d.
Ellakande	2 do	palish to darkish biscuits, 5s. 5½d.
Heatherley	2 do	very fine pale and palish amber biscuits, 5s. 7¾d.
Ellakande	3 do	darkish to darkish biscuits, 5s. 6¼d.
M (in diamond)	1 do	and 1 bag mixed biscuits, sheet, crepe and scrap, 5s 3¾d.; and 4s.
Hattangala	2 do	good pale and palish amber biscuits, 5s. 7¾d.; 1 case good darkish pressed crepe, 5s. 2¾d.
O.E.C. (in diamond) Mahabeira	2 do	good small pale biscuits, 5s. 5½d.; 1 bag pullings, 3s. 11d.
M.A.K. (in diamond)	1 do	palish scrap and rejections, slightly heated, 3s. 4d.
Kahagalla	1 do	darkish scrap and rejections 3s. 8¼d.
Halgolle	1 do	good pressed block scrap and rejections, 4s. 4¾d.
Maddegedera	1 do	good palish scrap and rejections from biscuits, 4s. 2d.

STRAITS SETTLEMENTS.

Jebong	8 cases	fine pale crepe, 5s. 8½d.; 1 case darkish to dark crepe, 4. 9¼d.; 6 cases good palish to darkish crepe, 5s. 2d¾.
L. E. (Muar in triangle) Straits	2 do	good palish crepe, 5s. 8½.; 10 cases good darkish to dark crepe, 4s. 10½d.
Teluk Batu	4 do	good palish to darkish sheet, 5s. 5¾d.; 5 cases good palish to darkish scrap, 4s. 6d.; 1 case black pressed crepe, 4. 8d. 1 bag rejections, 3s. 2d.

S.R. Co., Ltd.	23 do	good darkish scored sheet, 5s. 5½d.; 1 case good palish pressed crepe, 5s. 8d.; 2 cases good palish to darkish pressed crepe, 5s. 7½d.; 1 case darker, 5s. 2d.; 1 case similar, 5s.; 2 cases thick dark pressed crepe, 5s. 0¼d.; 4 cases darker 4s 9¾d.; 3 cases darker, 4s. 9¾d.; 1 case black, 4s. 6½d.; 3 cases thick dark pressed crepe, 4s. 5¼d.
K.P Co., Ltd.	1 do	good palish to darkish sheet, 5s. 5½d.; 1 case good large palish to darkish biscuits, 5s. 4¾d.; 1 case scrappy rejected sheet, 4s. 8¼d.; 5 cases palish to darkish scrap, 4s. 1½d.; 3 cases good large palish to darkish biscuits, 5s. 5d.; 1 case scrappy rejected sheet, 4s. 8d.; 1 case good palish pressed scrap, 4s. 6d.; 1 case good palish to darkish pressed scrap, 4s. 7d.
P.S.E. (in diamond)	11 do	fine small palish sheet, 5s. 3¾d.
G.U.L.A. (in diamond)	5 do	fine small palish sheet, 5s. 5¾d.; 1 case rejected biscuits, 4s. 5d.; 1 case scrappy rejections, 4s. 6d.
R.R. (S. in dia- (mond	9 do	fine small palish sheet, 5s 3¾d.
S.R. (S. in diamond)	3 do	thick dark rejections, 4s. 3d.
Highlands (*	27 do	good palish to darkish scored sheet, 5s. 5¾d.; 7 cases good thick palish to darkish crepe, 5s. 3d.; 5 cases good darkish to dark crepe 4s. 11¾d.; 5 cases darkish crepe, 5s. 0½d.
Batu Unfor Estate	9 do	good palish to darkish scored sheet, 5s. 6d.; 3 cases darker 5s. 5¾d.; 1 case good palish to darkish thick crepe, 5s. 4¼d.; 1 case darker, 5s. 0½d.; 3 cases darkish crepe, 5s. 0½d.
C.M.R.E .Ltd.	11 do	fine pale and palish crepe, 5s. 8d.; and 5s. 7¾d.; 13 cases fine palish to darkish crepe, 5s. 6d.; 10 cases good darkish and dark crepe, 5s.
B.R.R. Co. Ltd.	5 do	good palish to darkish thick crepe, 5s. 3d.; 11 cases good darkish, crepe, 4s. 10½d.; 3 cases darkish, 4s. 10¼d.; 11 cases good palish to darkish scored sheet, 5s. 6d.

The Ceylon Camphor Industry.

By E. J. Young.

(A Paper dated June 30th, 1906, read before the Rangala Planters Association, Ceylon).

I gathered the following information on camphor cultivation from several sources:—

The present price for crude camphor in the London market is 360s. per cwt., and this high price is entirely owing to the late war, and the consequent disturbed state of Formosa. The price of refined camphor tablets to-day is 4s. per lb. Many think the present price cannot be relied on for any length of time, and it will eventually return to the normal state of 180s. per cwt. (It has now fallen to 320s. for crude—1/7/06.) Camphor has been sold as low as 60s. per cwt. (in 1895). In Ceylon, camphor grows best at 3,000 feet and upwards, and takes 4 to 5 years to get into clipping stage. Including all expenses, it costs in Formosa 80s. f.o b.; there is no reliable data on this point from Ceylon, however.

As far as I am aware, Mr. Royden Hughes is the only planter who has grown this produce to a merchantable state in Ceylon; he informed me that he had last year 10 acres under camphor at a yielding stage, and that the produce from this area for 1905, when shipped, amounted to 1 cwt, and sold privately in Mincing Lane for 275s. Mr. Hughes could not say what the probable yield would eventually come to—or the cost f.o.b.—but he was of opinion that 275s. per cwt. would leave a handsome profit. Whilst again, there are others who think this produce is likely to decrease

in value—provided it can be had from other sources than Formosa and Japan, and the monopoly broken—these authorities say Japan cannot, even if she were inclined to, flood the market without seriously damaging her sources of supply, as each tree is cut down and destroyed.

But the camphor resources of Formosa are not "boundless and inexhaustible. They have diminished at least 15 per cent in the last twenty-five years. In the settled districts the tree is practically extinct, and every year the area of settlement increases. At present, camphor making and settlement go hand in hand; the stills are never far from a village, even when in the "Savages' country." Another authority says that, "Considering all the available data it will be safe to estimate that, allowing for a considerable increase in the output, there is enough camphor in Formosa to supply the world for fifty years to come." I am very doubtful if the establishment of the Formosa Monopoly will have a beneficial effect on the future of camphor. One good feature, however, is that it gives the Japanese Government a direct interest in seeing that the world's chief store of camphor is properly husbanded.

It is true that camphor laurels are found growing wild in other countries besides Japan and Formosa—for instance, in Indo-China, as also in Sumatra—but they do not seem to be available for camphor-making to any extent; at the present time, therefore, we find the world's supply of camphor more than ever under Japanese control. Let us hope this control will be honestly exercised!

I am informed in regard to camphor in Formosa that:—"Under favourable conditions an average of thirty feet in height, with trunks six to eight inches at the base may be expected in trees ten years from the seed. But trees under thirty years growth are reckoned as of no use for camphor making, When a camphor tree is cut down, the stumps if allowed to stand, will grow fresh shoots."

The Formosa system of working camphor is quite contrary to that of Ceylon where only the tips and younger branches are clipped periodically, and the stuff distilled. To have a paying camphor concern in Ceylon, I consider it would be necessary to plant at least 50 acres; and 100 acres under this cultivation would be still better. I have just seen and carefully examined a very interesting specimen of the *Cinnamomum camphor* tree, at the Royal Botanic Gardens, Edinburgh. It is in the "Temperate House," where in winter the temperature often falls to 34°. This tree at present stands about 40 feet in height, and the stem at 4 feet above the ground is $11\frac{1}{4}$ inches in girth. The age of this specimen is very doubtful; but it is said to be from 15 to 20 years old. The head gardener informed me that to his knowledge this tree had made 20 feet growth within the last 7 years when he planted it out. This tree was never known to flower or seed, and strange to say, Mr. Sinclair reports the same singularity with regard to his camphor on Rangala and in Ceylon generally. Undoubtedly, the camphor tree will yield and flourish in most tropical, and especially sub-tropical, countries. It grows freely in Ceylon at sea level, and I have seen it in great luxuriance at Hakgala, 4,500 feet above sea level; and at the same time it was flourishing in Nuwara Eliya at 6,600 feet elevation. Only very ecently a friend told me he knew of a grove of camphor of satisfactory growth in Southern Italy.

To my mind the danger ahead for this cultivation is that it will soon be over-produced, and consequently the price will fall to a non-paying level. I had a talk with Mr. R. S. Corbett on the subject, and he pointed out that camphor was an article of commerce that could easily be over-supplied. He remembered when it was selling in London at 60*s*. per cwt., and would again revert to this figure were the article laid down in profusion. On the other hand, Mr. F. B. Eastwood is an enthusiast in favour of camphor, and when I told him of Mr. Corbett's views, he said "Quite true, but that is all altered now, for you cannot make celluloids without camphor, and the manufacturers must have it at any

price, so it cannot be over-produced." After my own experience in over-production of cardamoms and cinchona, I am inclined to agree with Mr. Corbett, that great care should be exercised not to overdo camphor.

(*Copy of Letter from Mr. F. B. Eastwood, dated London, 11th July, 1906, in connection with Mr. E. J. Young's paper on Camphor.*)

Dear Mr. Bartlett,—I am sorry to have been unable to write to you before in reply to yours of the 2nd instant, enclosing me Mr. Young's interesting paper on camphor.

With regard to Mr. Young's wish to find out more about celluloid and the quantity of camphor used annually by manufacturers; this, we fear, is almost impossible. Up to about ten years ago regular statistics of shipments of crude camphor from Japan and Formosa could be ascertained without much difficulty; but the manufacture of refined camphor in Japan was at that date of little importance, so that the quantity of crude camphor used in manufacture in Europe and America could be arrived at with a certain amount of accuracy. The Japanese monopoly and the Government encouragement of the manufacture of camphor refining has made it quite impossible to obtain any statistics that can be depended upon; this much we know, that the quantity of camphor used by refiners for disinfecting purposes is very greatly reduced on account of the increased prices ruling since the establishment of the monopoly, and the consequent introduction of cheap substitutes; but, on the other hand, the manufacture of celluloid has largely increased in both Europe and the United States.

What quantity of crude camphor is necessary for the manufacture of celluloid has never been divulged outside that trade, and it is a secret which appears to be jealously guarded by the manufacturers of that article. We have always been given to understand, however, that the percentage of camphor in celluloid is small, but there are some peculiar properties about the camphor crystals which are absolutely essential to its manufacture, and these crystals have hitherto defeated the great scientists in the many experiments which they have made to produce them artificially.

Turning to Mr. Young's article, I would remark that the present price mentioned in the third line is rather lower than when I spoke to him, to-day's quotations being 320s. to 330s. per cwt. Further on Mr. Young mentions that camphor has been sold at as low as 60s. per cwt., but I would point out that the lowest price during the last fifteen years was 70s., which so far as I recollect was in 1895, and it must be added that the manufacture of celluloid was at that time in its infancy, which manufacture has altered the whole position and consumption of camphor. For that reason I think that Mr. Corbett's view need not be taken seriously—*i.e.*, that camphor would again revert to 60s. "were the articles laid down in profusion." This profusion is not possible so long as the only sources of supply are under the control of the Japanese Government, and it will take many years to produce in Ceylon or other countries a sufficient quantity to disturb the position held by the monopoly.

Re the Japanese cutting down of trees, they have for some years been very strict about replacing wherever they cut down; whether they carry out the same practice in Formosa, I am unable to say, but with such prudent people I should think it very probable that such is the rule there also.

Count Butler, who at one time was the principal shipper from Formosa, once told me that he could not produce camphor and place it on the market to show him a fair profit with the conditions then existing (about 1894), under about 80s. per cwt.; and he also told me, what I have had confirmed by others acquainted

with those parts, that the camphor tree takes from 30 to 50 years to grow to a commercial value.

I have seen what is called leaf camphor occasionally come here from the mainland of China, where in the provinces of Kwang So and Fokien there are a certain number of camphor trees scattered about in the forests.

Whether this leaf camphor has been coming over recently in the small shipments which have been made during the last twelve months, owing to the extreme prices that have been paid for crude camphor, I cannot say; but this we do know, that the camphor from the mainland of China is not usually so well distilled and contains much more oil, and is sometimes of a dark colour; whether those defects are caused by the leaves, I am unable to say.

The original price fixed by the Japanese Monopoly was 178s. per cwt., so that even under favourable conditions, so long as the monopoly remains in existence, I do not think there is any probability at all of the price dropping below that figure, at the same time the present inflated price cannot be expected to be maintained, as I told Mr. Young, when once supplies come to hand from Formosa and Japan either in crude or the manufactured state.—Believe me, yours very truly,

(Signed) FRANK B. EASTWOOD.

FIBRES.

COTTON SEED SELECTION.

Station No. 1 in the highway of farm progress is good seed.

Planting selected seed of the best variety and of the highest vitality is absolutely essential to the production of the best crops.

Buying the best seed, if the farmer does not have it, is commendable; but this must be followed by the best cultivation and the most careful selection to eliminate minor defects and improve the excellencies of the type, or the seed will deteriorate.

Cotton Seed.—That like produces like, is a law of plant life to be observed in all details.

1st. From your best field of cotton select the best portion, and in this choice division mark the most vigorous and productive plants, showing short joints and fruit limbs near the bottom. The entire plant should be an exceptional fruit producer. Seed should be selected from these marked cotton stalks, but the top bolls and the bolls on the ends of the limbs should not go into the lot for seed; they tend to make the cotton later. The bolls selected for seed should be picked by special field hands, sent in advance of the regular pickers. This seed cotton must be stored in a dry place and watched to avoid mixing.

Special care must be taken at the gin, that the gin and floor are free from all other cotton seed before ginning. Store this seed in a dry place.

Where greater length ot staple is desired, select for seed such bolls only as show the longest staple. By careful selection most any desired qualities, or characteristics, can ultimately be secured.—*Louisiana Planter.*

EDIBLE PRODUCTS.

Cacao Cultivation in Ceylon. V.

By Herbert Wright.

(Illustrated.)

PERIODICITY OF THE CACAO TREE.

It is necessary to consider the periodicity of the vegetative and reproductive systems of the cacao tree before dealing with the subject of its cultivation and the harvesting of the crop. There are reasons for believing that the most successful results in cultivation will probably be obtained by taking advantage of the normal periods of varying activity which characterise the different stages in the life of the tree rather than by the application of methods or substances to stimulate parts of the tree during their periods of minimum activity.

The cacao trees on a large area produce leaves, roots, flowers, and fruits throughout every month of the year, and many cultivators have adopted methods with the idea of making the trees more productive at periods of the year which do not agree with those of the natural periodicities. It is possible, by affecting the water supply to the roots and by the pruning of branches and roots, to considerably change the periodicity of vegetative and sexual tissues, but it is a course which, if not carried out very carefully, may be accompanied by a serious reduction in the cacao crop.

FOLIAR AND ROOT PERIODICITY.

In all tropical areas heat and light are intense, and these, together with the heavy rainfall of many places, result in a conspicuous growth of vegetation at most times of the year. Though the climatic changes are not analagous to the seasons of a temperate zone, the plants in the tropics are just as subject to periodical changes of rest and activity as those of cooler zones. The periodicities of the climates in cacao-growing countries differ considerably, and the remarks here given have reference mainly to the cacao trees in the Peradeniya district of Ceylon ; a change in climatic periodicity is usually followed by one of plant periodicity.

The leaves of the cacao tree show an increase in number year by year until by about the eighth or tenth year a standard size appears to be attained. Throughout these first years the foliar production is irregular, but as time goes on there is a tendency to produce a large number of new leaves during two or three periods each year. On a cacao estate with all the trees in bearing it is impossible to find a healthy specimen absolutely leafless even during the hottest and driest part of the year ; most of the trees produce a few leaves every month in the year, but reserve their periods of maxima foliar production for the months of February, March, and September, considerations to be kept in mind when dealing with the periodicity of the flowers and manurial operation. The periodicity in the root growth of cacao trees in Ceylon is but little understood ; the rootlets are formed during every month in the year, but during April-June and again in October-November there appears to be increased activity in this part of the plant. The general observations made on this part of the subject point to a periodicity of root activity in association with that of the foliage.

FLOWER PERIODICITY IN 1903.

An investigation has been made on the periodicity of flower production with a view of determining its relationship to that of the fruits and rainfall. Forty-two trees were under observation each day in the years 1903, 1904 and 1905. The flowers were plucked after they had opened, so that the physiology of the plant

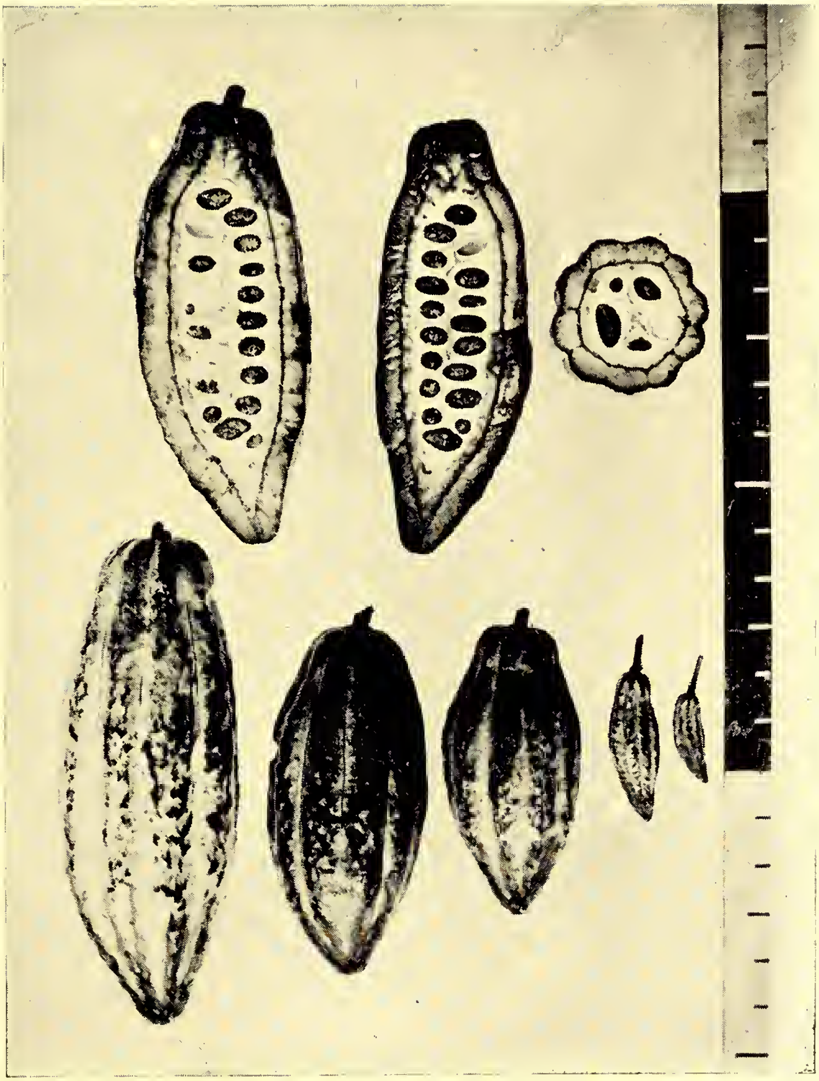

Photo by H. F. Macmillan.

DEVELOPMENT AND STRUCTURE OF CACAO FRUITS.

1–5 Cacao fruits of different ages; 1 (one week); 2 (two weeks); 3 (six weeks); 4 (ten weeks); 5 (17 weeks);

Longitudinal (6 and 7) and transverse sections (8) through ripe fruits, showing white and coloured seeds *in situ*.

Photo by H. F. Macmillan.

FORMS OF CACAO FRUITS.

Nicaraguan Criollo (1, 2 and 3); Theobroma pentagona (4); Amelonado (5); Criollo or Caracas (6); Forastero (7, 8 and 9).

would be disturbed as little as possible. It may be asserted that the removal of these newly-opened flowers would probably lead to a more prolific appearance of flowers at a subsequent date, but when one considers that an average tree produces only about sixty to eighty mature fruits in the whole year, the procedure adopted cannot be expected to greatly alter the flower periodicity in question. Not more than 0·2 to 0·4 per cent of the flowers produced on a cacao estate planted 12×12 feet and yielding 3 cwt. of cured cacao per acre, per year, develop into mature fruits; they are easily detached when in full bloom or after withering. The number of flowers produced in the year 1903 varied from 178 on tree number 5,725, to 33,534 on tree number 5,782. The average number of flowers produced, per tree, for 1903 was 5,666, equal to 1¾ million per acre. In order to show the variability, the following figures are quoted for six selected trees :—

TABLE SHOWING THE FLOWER PERIODICITY OF SIX SELECTED CACAO TREES DURING 1903.

	Tree No. 71.	Tree No. 5,786.	Tree No. 5,782.	Tree No. 5,768.	Tree No. 5,798.	Tree No. 5434.
January ...	67	65	165	113	127	43
February ...	388	245	353	34	17	7
March ...	1,992	372	4,269	479	704	91
April ...	1,292	438	4,578	334	1,428	33
May ...	2,978	2,439	7,050	1,507	7,605	641
June ...	1,576	756	1,531	150	495	144
July ...	1,950	1,829	3,509	272	476	123
August ...	1,391	442	2,148	214	193	97
September ...	1,285	423	3,778	595	308	60
October ...	1,246	755	3,376	445	89	36
November ...	1,192	496	1,639	232	63	15
December ...	998	944	1,138	276	52	26
Total ...	16,355	9,204	33,534	4,651	11,457	1,316

The following table gives (1) the total number of flowers produced on the forty-two trees under observation; (2) the monthly average of flowers per tree for the year 1903 :—

	Total Flowers for forty-two trees.	Average No. of flowers per tree.
January	4,281	102
February	4,616	109
March	25,562	608
April	18,616	443
May	71,839	1,710
June	14,982	356
July	21,811	519
August	15,347	365
September	21,124	503
October	17,191	409
November	11,080	264
December	11,556	275
Total ...	238,005	

FLOWER PERIODICITY FOR 1904.

The observations were continued on the same trees as in 1903, and the following are the records showing (1) the total number of flowers produced on the forty-two trees under observation; (2) the monthly average of flowers per tree during 1904 :—

	Total flowers for 42 trees. 1904.	Average No. of flowers per tree. 1904.	Average No. of flowers per tree. 1903.
January ...	11,799	280	102
February ...	12,953	308	109
March ...	29,250	696	608
April ...	57,287	1,363	443
May ...	84,011	2,000	1,710
June ...	84,338	2,008	356
July ...	32,345	770	519
August ...	11,326	269	365
September ...	15,567	370	503
October ...	24,852	591	409
November ...	19,971	475	264
December ...	17,791	423	275
Total ...	401,490	9,553	5,663

The average number of flowers produced, per tree, for 1903, was 5,663, equal to 1¾ million per acre at 300 trees to the acre. The average number of flowers, per tree for 1904, was 9,553, equal to 2⅘ million per acre, per year. In 1904 the trees were much freer from disease. An interesting case was observed on tree numbered 4,031 on plot 3. This tree produced flowers every month in the year, but on the 20th June, 1904, it possessed no less than 27,632 flowers, the counting of which occupied the attention of two men 1½ days. On the 20th July there were only fifteen young fruits on the same tree, and throughout the year the tree did not produce one hundred fruits.

In order to show the variability, during 1904, the following figures are quoted for six selected trees :—

TABLE SHOWING THE FLOWER PERIODICITY OF SIX SELECTED CACAO TREES FOR 1904.

NUMBER OF FLOWERS PRODUCED EACH MONTH.

	Tree No. 71.	Tree No. 5,786.	Tree No. 5,782.	Tree No. 5,768.	Tree No. 5,798.	Tree No. 5,434.
January ...	1,036	674	1,429	296	110	34
February ...	1,074	929	1,505	257	1,191	46
March ...	2,764	1,547	3,191	820	284	160
April ...	5,032	3,048	5,076	1,944	600	379
May ...	9,079	3,256	9,875	2,744	1,529	509
June ...	9,508	5,499	7,793	2,127	1,241	756
July ...	2,898	1,743	1,537	963	525	522
August ...	1,376	391	1,189	201	130	57
September ...	1,519	666	1,836	187	153	149
October ...	2,232	1,017	2,953	444	234	203
November ...	1,973	674	2,051	376	213	54
December ...	1,335	572	1,333	411	204	62
Total ...	39,826	20,016	39,768	10,770	6,414	2,931
Total for the same trees during 1903...	16,355	9,204	33,534	4,651	11,457	1,316

The data for the flower production during 1905, on the same trees is now given for comparison with previous years.

MONTHLY FLOWER PERIODICITY, 1905.

	Total flowers for 42 trees.	Average number of flowers per tree.	Average number of flowers per tree.	
	1905.	1905.	1904.	1903.
January ...	13,524	322	280	102
February ...	15,893	378	308	109
March ...	19,773	470	696	608
April ...	19,999	476	1,363	443
May	55,752	1,327	2,000	1,710
June	157,913	3,759	2,008	356
July	50,730	1,207	770	519
August ...	25,354	603	269	365
September ...	10,697	254	370	503
October ...	5,650	134	591	409
November ...	40,946	974	475	264
December ...	88,879	2,116	423	275
Total ...	505,110	12,020	9,553	5,663

NUMBER OF CACAO FLOWERS ON ESTATES.

These observations prove that there is not a month in the year when flowers are not produced if a minimum of say ten trees is chosen. On six out of the forty-two trees selected no flowers were produced during certain months of 1903, these months including only February, March, and April.

The total number of flowers produced on a cacao estate may be from 1,700,000 to 3,606,000 per acre, per year (300 trees to the acre). A yield of 3 cwt. of cured cacao per acre means that at the most only about 8,000 flowers develop into mature fruits on each acre per year, or, in other words, a balance of 1,692,000 to nearly 3,600,000 flowers, per acre, per year, are at present of no value to the average cacao planter. A large number of flowers appear to have been fertilised, but the expanding fruits soon turn yellow and shrivel; for the year 1903 out of a total of 569,738 promising fruits, no less than 288,205 were of this class.

These facts show that there is ample opportunity for research in connection with flower pollination and fertilisation. The cacao trees on which these observations were carried out were normal; it would have been possible to select much more vigorous plants, and to show that the average number of flowers produced was in excess of those under observation for that year.

For the present it is important to note that the period for maximum flower production was in the months of April, May and June, and that this was preceded or followed by minor periods of floral activity in the years 1903, 1904 and 1905.

THE LEADING TEAS OF THE WORLD.—INDIA.

By Herbert Compton.

In dealing with the varieties and characters of the teas grown in the different districts of India, it is difficult to generalize. In the first place, in the same district there may be a vast deviation in quality owing to individual causes—such as soil, the management and the system of manufacture followed. Then, again, some plantations go in for quantity, which means low-grade teas; while their neighbours confine their efforts to turning out a small crop of the very highest liquoring character. Lastly, there are the differences in the crop itself, which is acted on by the changing conditions of the climate. It is not too much to say that the average plantation makes four distinct qualities of tea in the year, each with its distinctive characteristics. There is the "spring crop," which used to be considered the choicest in China, but is a poor liquoring one in India, where its quality is sacrificed to "making

the bushes," by letting the shoots grow, and so forming a "new head" of young wood. You cannot make good tea from old leaf—and "spring crop" leaf is always old. Then comes the summer crop, generally the best of the year, forced out as it is by a powerful sun acting after refreshing showers, and plucked early. The rainy-season crop is poor, washed-out, thin stuff, as a rule, owing to excess of moisture and want of ripening sun influence. The autumn or fall crop has its own peculiar flavour, often very fine, and although the leaf is red to look at, the liquor is highly valued. These conditions will explain the variations and fluctuation in quality that cannot be avoided, and make "generalizing" a task in which it is easy for the critic to pick holes. With these preliminary remarks I will turn to the districts in detail.

The 1904 returns show that British India contains in the aggregate 524,527 acres, producing 222,203,661 pounds of tea, and they may be classified as follows:—

Assam, or the Bramaputra Valley, contains 205,990 acres, yielding 83,360,173 pounds of tea. Besides being by far the largest district, it is the one which produces the best quality teas all round. Assam teas are noted for their strength chiefly, and their violet-like fragrance. They are the back-bone of a blend, and will "pick-up" and give a character to a larger percentage of inferior tea than can be accomplished by the produce of any other district. When this strength is combined with the strikingly fine flavour obtainable, there is nothing that can touch the produce of this leading tea district in India.

Kachar and Sylhet.—These two districts are always bracketed together, and lie to the south-west of Assam. in what is known as the Surma Valley—a name often applied to them in combination. Sylhet is slightly the larger (72,497 acres), and the outturn of the two districts amounts to 70,000,000 pounds. In quality, their teas lack the strength of Assam, and do not realize nearly as good prices, the average value being about two-thirds that obtained for those of the leading district.

The three above districts form one group, and may be described as the head-quarters of tea-growing India. The second group of districts lies almost due west of Assam and due north of Calcutta, and consists of Darjeeling, the Dooars and the Terai, but the latter has been practically abandoned owing to its bad climate.

Darjeeling (acres, 50,623; crop, 13,626,490 pounds) is situated on the slopes of the Himalaya Mountains, the elevations of the gardens ranging from 3,000 to 6,000 feet above sea-level. The climate is cool, and in consequence the season a restricted one, and the crop short. But the teas are noted for their exquisite flavour (which it has been found impossible to obtain from any other part of the world), and when well pronounced they fetch fancy prices. There is not much strength in Darjeeling teas, and when they lack the true flavour they command only moderate rates.

The Dooars lie below Darjeeling, at the foot of the Himalayas, on the flat ground. The acreage is 77,279, and the outturn 32,452,478 pounds. Although not so strong as those of Assam, Dooars teas generally yield a good colouring liquor, and have been likened to a blend of the produce of the Bramaputra and Surma Valleys. They are very useful for blending.

Next in order of importance come the tea districts in the Madras Presidency, in Southern India. These are Travancore, the Nilgiris and the Wynaad.

Travancore (acres, 24,712; crop, 9,073,880 pounds) lies at the very end of the Indian peninsula, and just opposite Ceylon, and enjoys a very similar climate. It is a young district, but remarkably go-ahead, having manifold advantages of labour

and abundant rainfall. The teas are of a light quality, but without much strength, although when grown at high elevations they possess a rather fine flavour.

The Nilgiris and the Wynaad lie to the north of Travancore and contain, together, 8,620 acres, producing 1,639,060 pounds of tea. The former teas occasionally possess some fine flavour, but are generally plain-liquoring. The same may be said for the teas of the Wynaad, which do not commend themselves to buyers. But the district is a very young one, and with more experience of the art of manufacture its produce will doubtless improve.

Our next step carries us two thousand miles to the northwest, to the very confines of Northern India. Here are situated the districts of Kangra, Kumaon and Dehra-Doon, which once drove a very thriving trade in green tea for the Central Asian market, until the influence of Russia destroyed it by high tariffs. There these districts are planted solely with the China variety of the bush.

Kangra (acres 9,347; crop, 1,916,739 pounds).—The black teas from this district are thin in cup, but have a distinctive flavour of their own, being grown high upon the slopes of the Himalayas. Occasionally the district sends to market the produce of a fine flavoured "flush," but as a rule they are much lacking in quality. Kangra teas are largely drunk by the European community in India.

Kumaon and Dehra-Doon (acres, 7,953; crop, 2,573,000 pounds).—These teas are similar to Kangra, but, if anything, inferior in cup. Although some of them are grown at high elevation, they do not possess the "hill flavour" which gives teas even without strength a value of their own.

There remains the districts of Chittagong and Chota-Nagpur, which are the smallest of all. The former contains 4,369 acres, and yields 1,480,659 pounds of plan-liquoring tea. In Chota-Nagpur, which suffers from want of rainfall, the crop only amounts to 326,202 pounds, and is of very poor quality. Indeed, were it not for the cheap labour in this district—the ordinary wages are only three pice (cents) a day—tea could not be grown profitably.

In Burma there are at present 1,406 acres of tea, producing 266,066 pounds, but the crop is of the coarsest and commonest quality, and only intended for native consumption.

The year 1904 showed, for the first time on record, a reduced area under tea in British India. This was due to the abandonment of old and worn-out gardens (in some of which the China variety of plant still survived) owing to the depression in the British tea market caused by the increased taxation of the article. In that year the duty on tea was raised to 16 cents (U.S.A.) a pound, which decreased consumption, and led to prices falling to the lowest level on record. Since then, however, a remssion of four cents in the duty has begun to bring back prosperity, and the planters prospects are decidedly good.—*Tea and Coffee Trade Journal.*

THE CHINA TEA INDUSTRY.

It has been stated so often that a movement for actively pushing Chinese tea is on foot that the rumoured formation of an association for that purpose is not surprising. The "Grocer," commenting on this rumour, says :—"The slump in China tea of recent years, and the evident dislike of the public for it—probably because of that 'scenty flavour' which most people find highly objectionable—have put the trade in such general disfavour that a clear road is left for those who saw that China tea may still have its dietetic recommendations and its votaries. Without going so far as to echo the words of interested optimists that there is a 'boom' in China tea,

we have some evidences of a revival in the trade. Obviously if it is to be revived there should be conscious effort to that end, and one of the means of exerting such effort is, in these days of combination, a Union, or League, or Association of some kind.

We were informed this week that a 'China Tea Association' is actually in existence; but that apparently there is nothing more than an adumberation of such a body. It is nevertheless quite possible that some leading people in the trade may think that the psychological moment has arrived for convening a meeting in order to form such an association. It must be admitted that those interested in the China tea trade have not hitherto made the most of their opportunities. The efforts made to restore the popularity of the Chinese leaf have received support and free advertisement from various quarters, but the "psychological moment" has been allowed to pass again and again. The cult of Chinese tea is not neglected in the training of the young grocer who is frequently reminded by those who lecture to him that tea from China is the thing from the medical point of view, and that the delicate palate will always give the preference to it.

Notwithstanding all this, the majority of tea drinkers here find Indian and Ceylon teas good enough for them, and they do not seem deeply affected by the information that real lovers of tea drink the Chinese leaf only, and that in exclusive circles it is consumed as a matter of course. We doubt if it be possible to engineer a boom in China tea, although so long as medical men continue to sing its praise and professing "experts" give themselves airs about it, importers of Chinese tea can always claim that the time has arrived for making an effort to increase its consumption.—*H. and C. Mail.*

Dry Grains of Ceylon. II.

BY J. F. JOWITT.

Pani-Chamai, T.—Pani signifying "Dew," so called because it is said to require very little water, dew alone sufficing for its growth. *Meneri*, S.

Panicum Miliaceum.—An annual; stems, leaves, and sheaths clothed with long soft hairs. Habit erect at first, as the seeds ripen the panicle droops and becomes purplish in colour. Stems stout, tufted, leafy up to the panicle, joints bearded; leaves linear, acuminate, base rounded, ligule of long hairs; panicle large, decompound, branches fascicled; spikelets solitary, pedicelled, ovate, acute.

Ellu Chamai or Chiru Chamai, T.—Ellu is the name for gingelly, and is used to denote anything small in size. Chiru, Tamil for small, little.

Heen Meneri, S.—Heen, small. I find that this grass is often called Meneri, without the prefix.

Panicum Miliare.—This differs from *P. Miliaceum*, in its smaller size, in the joints of the stem, stems, sheaths and leaves being hairless or practically so. The panicle is sub-erect and more contracted than in *P. Miliaceum*, and the spikelets much smaller. The seeds of these two cereals though resembling one another in some respects are easily distinguished.

P. Miliaceum.	*P. Miliare.*
Shining, broadly ovate, 3 mm., apex obtuse, yellow, more often olive coloured.	Shining, oblong ovate, 2 mm., apex acute, generally blackish, yellow, or olive coloured.

Veins in both light coloured, 5-7 on convex side, converging from base to apex, on the flattened side, 2.

These species are fully described in Trimen's Flora, Vol. V. p. 150.

There seems some confusion in Trimen's Flora regarding the vernacular names of these grasses, *vide* note under *P. trypheron*, Vol. V. p. 152.

I have given above the Tamil and Sinhalese names for *P. Miliaceum* and *P. Miliare*.

Wal-Meneri, wal=wild, is *P. trypheron* a closely allied grass.

P. Miliaceum is the most nutritious of cereals grown in Ceylon, and *P. Miliare* only a little inferior to it. They and "Amu" (*Paspalum scrobiculatum*) are used in the Four and Seven Korales and in some parts of Uda-Nuwara by labourers working away from home, as their mid-day meal, being boiled with coconut milk if procurable, if not, with water, salt and chillies being added as a relish.

Hackel in "True Grasses," p. 76, says: "Cultivated from prehistoric times. Native country unknown, but probably the East Indies, where, and in China and Japan as well, it is yet much cultivated. It is raised to a considerable extent in South Russia and Roumania, but only here and there in other parts of Europe. Several varieties are distinguished by the colour of the fruit and the habit of the panicles."

The following, showing the alimentary value of cereals I have culled from "Food Grains of India" by A. H. Church, M.A., Oxon., F.C.S., F.I.C., to whose instructive publication those interested in the subject are referred.

An adult man weighing 140 to 150 lbs. requires per diem about

Albuminoids	... ...	4·16	ozs.
Oil or Fat	... ...	3·12	,,
Starch	... ...	14·29	,,

Albuminoids are the nitrogen compounds such as albumen, fibrin and legumin, the chief formative and reparative compounds of food; they may also yield fat, and by their oxidation set free heat and actual energy. The carbon compounds such as starch, sugar and oil serve to keep up the heat and do the work of the body by the discharge of potential energy during oxidation in the organism. The fat of the body is formed in part from the fat or oil in the food; in part from the starch and sugar.

In the following table "Nutrient-Ratio" is a term used to denote the proportion of albuminoids to starch, including with the starch the starch equivalent of any oil or fat present in the food, recent experiments having shown that one part of vegetable oil or fat is practically equivalent to 2·3 parts of starch, 2·3 is accordingly used in this table as the "Starch equivalent" of one part of oil.

"Nutrient Value" refers to the sum total of the albuminoids, the starch and the starch equivalent of oil.

Name of Cereal.	"Nutrient Ratio" or Albuminoids to Starch.	Albuminoids, percentage of.	Nutrient Value.
Eleusine coracana	1 : 13	5·9	84
Paspalum Scrobiculatum	1 : 11·7	7·	89
Oryza Sativa	1 : 10·8	7·3	86½
Panicum Crus-galli var. frumentaceum	1 : 9·5	8·4	88
Panicum Miliare	1 : 8·4	9·1	85
Zea Mays	1 : 8·3	9·5	88½
Andropogon Sorghum var. vulgare	1 : 8·2	9·3	86
Pennisetum typhoideum	1 : 7·6	10·4	89½
Setaria italica	1 : 7·4	10·8	91
Panicum Miliaceum	1 : 6	12·6	89

The standard "Nutrient-ratio" is set down as 1 : 5; from the above table it will be seen that very few of the cereals approach sufficiently near to the standard to form satisfactory aliments when used alone for any length of time.

Panicum Miliaceum is the nearest and *Eleusine coracana* the furthest removed from the standard nutrient ratio, and in the latter case those that live entirely on kurakkan consume daily about 23, 2 ozs. too much of starch,

Mr. Church shows that by the judicious combination of some of the pulses with the cereals and with the addition of a small quantity of oil, the necessary proportions of albuminoids and starch can be supplied.

Karal—Amu, S., Paspalum Scrobiculatum.—As far as I can ascertain there are three varieties of Amu recognised by the Sinhalese, namely Karal, Badu, and Math Amu. Karal, I am told is the equivalent of "Spike"; Amu=inebriating, Badu and Math Amu I have not succeeded in growing. Badu=belly, alluding to the spikes ripening their grain within the leaf and sheaths. This grain is boiled with coconut milk and is considered a luxury by the Sinhalese. Math=giddiness; the grain is boiled with double the ordinary amount of water, which is thrown away as being poisonous; eaten by servants in Sinhalese households.

Karal Amu, S., Paspalum Scrobiculatum.—Stems 2 feet with me, probably more in good soil, tufted, erect, leafy from the base; leaf long, narrow, flat, acuminate, margins scaberulous; sheath compressed, loose, mouth hairy, ligule short, membranous; peduncles of inflorescence long, slender, slightly channelled; spikes 2—3, probably more, 1½—3 inches long or more; spikelets biseriate, 2 mm. or a fraction more, nearly obicular, shortly pedicelled, rhachis narrow, herbaceous; Glumes I and II 3—5 veined var. b? Kunth, l.c. *vide* note Trimen's Flora, Vol. V. p. 122.

In plants grown from seeds sent to me from Hettimulla, Kegalle, labelled "Badu Amu," but which do not differ from plants raised from seed from Uda-Nuwara and Hatella, said to be "Karal Amu," Glume II is wrinkled or pitted towards the margins. Used for making coconut milk rice, considered a luxury and generally eaten after a meal of rice.

Waraku, T. Paspalum Scrobiculatum, var a?—This variety, though it differ materially from the preceding one, is known as "Karal Amu" by the Sinhalese, both varieties being grown together. Stem 12 inches, tufted, erect, rather stout, leafy from the base up, leaves 9—11 inches × ½ inch or more, bifarious, erect, flat, acute, margins scaberulous; sheaths compressed, loose, mouth hairy, ligule short, membranous, both leaves and sheath tinged with purple. Spikes 2—3, Distinct, spreading, 2—2½ inches long, exserted from the sheath on a stout channelled peduncle, peduncle herbaceous, broad, ventrally concave, winged, narrowed towards the ciliated tip; rhachis of spikelets broad, dorsally crinkled, spikelets 2 seriate, on short, stout, curved, puberulous pedicels, 3 mm. broad—Glumes 3, I and II equal, orbicular, membranous; Gl. I, 8—9 veined, II 5—8 veined, III coriacious, striolate, margins ncurved, thickened at the edges that overlap the striolate palea.

(*To be continued.*)

PLANT SANITATION.

Diseases of the Coconut Palm.

By T. Petch.

It is more or less axiomatic that the number of diseases to which a given plant is subject, and the virulence of such diseases if no special precautionary measures are taken, increase with the spread of its cultivation. It is rather surprising therefore to find from manuals and essays on coconut planting that there is apparently no disease of the coconut palm worthy of mention. This relative immunity is not confined to Ceylon, but, to judge from their publications, is shared by all other coconut growing countries. Insect pests are well known, and their treatment occupies a large part of the literature of the subject. Can it be that every disease has been attributed to "beetle," or is it that the climate of the coconut districts and the methods of planting really discourage the attacks of fungi? I think it may be assumed that the latter to a great extent are inimical to fungi in general. There have been alarming reports of coconut diseases in the past, *e.g.*, of leaf disease in Ceylon in 1889; but no very serious damage has been done, and the disease—or the fear of it—has passed away, and left no trace, not even a scientific record, nor a specimen by which it could be identified if it occurred again!

During the visitation referred to, it was generally stated that the particular disease was one which had been prevalent, but not serious, for a long time. Without a knowledge of fungi and a microscope such a statement in the case of a leaf disease could be only a mere guess. But I have now to record a disease, apparently of fungus origin, which really has existed for a long time, but which has only recently caused any serious injury or loss of trees.

This was first brought to the notice of the Department in 1903, but no information was left on record. Last year, a correspondent of the *Ceylon Observer* called attention to the condition of some of the palms near the Negombo Canal, and stated that "dead and dying palms were seen from the boat, between the second and fourth milestone on the canal. Sap was exuding from what appeared to be punctures on the stem made by an insect." In the early part of this year information to the same effect reached Peradeniya from several sources, and this particular locality was visited.

The affected trees are on a small island bounded by the canal and ditches, about a foot above the water level in the dry weather. The surrounding marsh is planted up in coconuts; these are remarkably stunted, so much so, that they resemble cycads. The diseased trees were covered to a height of seven or eight feet with black patches, caused by the exudation of sap from minute cracks in the outer tissue. The upper portion of the stem was usually unaffected. The tissue immediately beneath the crack becomes discoloured, generally brown at first and finally black, and this condition spreads internally until the patches from adjacent cracks coalesce. The whole of the interior of the trunk is ultimately reduced to a mass of humus mixed with fragments of the harder fibres. In advanced stages the tree bears only a few small fronds, but the "cabbage" is not diseased. The bud remains sound so long as a section of the stem shows a region of undecayed tissue. Severa trees were dug up, and it was found that in general the roots were dead on the side affected; and as the material, both root and stem, brought away for microscopic examination did not show any fungus hyphæ, it was thought possible that the death of the trees was primarily due to the decay of the roots owing to the

unsuitable situation. It was quite certain that the beetle observed only bored into the stem after it was dead. In order to test this conclusion, the treatment which is detailed below was advised, but as far as I could judge when I passed the place some months afterwards nothing has been done.

Quite recently one of our leading coconut planters (who had raised the question of this disease in 1903) kindly offered to show me other localities in which the disease existed, and under his guidance more valuable information was obtained. In a plantation at Nalla, which was visited, two thousand trees are said to be affected, and though none have yet died, the number of diseased trees is increasing. It was seen that the ideas founded on the observations made previously on the palms near the canal would not hold good there, but fortunately a clue to the origin of the disease has been found in the specimens there collected. The longitudinal cracks in the outer tissue are a more or less normal feature of the coconut stem. They are not necessarily connected with disease, though it is probable that fungus enters through them. In the earliest stages of the disease, the sap oozes out from the trunk and causes a brown or black stain on the exterior. If the diseased region is cut into during wet weather a quantity of sap runs out. The tissue beneath the black patch decays, finally becoming dark brown or black. Instances of this appear to be fairly common. There are numbers of old trees on which the disease has been at work for years, doing no more harm than locally destroying the outer tissues, the hard wood below being apparently too dense for it to operate upon. A hole, filled at first with dry fibres, is left in the stem.

But in the cases which have attracted attention recently, the first black or rusty patch is followed by others, usually on the same side of the tree, and the diseased regions extend internally until the whole trunk is merely a shell enclosing a brown or black soil-like mass.

There is no doubt that the progress depends on the character of the tree, and older trees appear to be less affected. But trees of all ages are attacked, and the difference appears to depend on age only in so far as the older tree possesses a well-developed region of dense "wood." The trees which are killed succumb in from four to six years.

The fungus which is supposed to be the cause of the disease is wholly internal. Its spores are formed in the decaying tissue, and are brought to the exterior by the exuding sap. In order to have the disease under observation, inoculations were made at Peradeniya with diseased tissue, and with the sap containing the spores and some bacteria. But the only trees available at Peradeniya are extremely old, and it is as yet doubtful whether the infection has been successful. It is only by making pure cultivations of the fungus and inoculating the trees from them that certainty can be arrived at.

In addition to the Hendalla and Nalle districts, I have seen odd trees affected in the neighbourhood of Kandy. "The disease is fairly prevalent everywhere, but so far has not done any serious mischief. It seems to have increased of late in certain localities." "The progress of the disease is slow, taking possibly four to five years to kill the trees, but we think it is sufficiently serious to warrant attention." These are the opinions of our leading coconut planters.

The following measures were tried several years ago and have proved successful. All the diseased tissues were cut out and burnt, the wounds were then burned with a torch of rags dipped in oil, and then covered with hot coal tar. All dead coconut trees should be burned. With respect to the last point, the advice recently issued by the American Department of Agriculture in the Philippines may be quoted. "The first thing to do in coming into possession of a coconut grove, or in planting a new one, is to thoroughly clean the ground. All

manure heaps, rubbish, rotting or fallen trees should be removed and destroyed at once. Rubbish heaps and decayed trunks if fallen should be burned." Now that America has taken a hand in tropical agriculture, we may confidently expect that coconut diseases will receive full attention; they have been the first to recognise that such work in the Tropics requires an equipment, if possible, better than they have in America.

In the article on Coconuts in Watt's Dictionary of the Economic Products of India there is a reference to a stem disease which may be the same as the one we are at present concerned with; the information, however, is not very definite, and the suggested remedy does not invite recommendation. "Palms suffer from the attacks of an insect named *bhonga*, which gnaws the roots of the tree. When a palm is suffering from the attacks of *bhonga*, a dark red juice oozes from the trunk. When this is noticed, a hole three inches square is cut in the trunk from four to six feet above where the juice is coming out, and is filled with salt, which kills or drives away the insect." The recorder does not suggest how the salt reaches the supposed insect! The Sinhalese say that the disease is the work of "Taldiya," but what "Taldiya" is they cannot tell.

The other diseases of the coconut palm in Ceylon do not call for much attention. The "Bud Rot" described in Circular 15 has not been recorded from any other locality. A leaf fungus, *Pestalozzia palmarum*, is extremely common in the low country, but as it never kills a tree it is disregarded. Up country it seems to be much less common. As its name indicates, it is a relation of the "Gray Blight" of tea; indeed, if the labels were removed from mounted spores of the two species (and there is practically nothing but spores to lay hold of in a *Pestalozzia*), no one will be able to relabel them with any degree of certainty. Most coconut diseases have been attributed to the effect of *Pestalozzia palmarum*, probably because all palm fronds bear that fungus, and it therefore occurred on the supposed specimens of any disease which have been sent to Europe. In Ceylon, it is confined to small spots on the leaves, and though it must to some extent retard the growth of the tree, it does not cause diseases of the bud or stem. The West Indian Bud Rot is still stated by some to be caused by it.

A recent report from Java by Dr. Charles Bernard states that serious damage has been wrought by *Pestalozzia* in the case of young trees. In a plantation containing 5,000 plants, a year old, every tree was affected, more than half were so badly affected that there was no hope of saving them, and about 1,000 had died. Spraying with Bordeaux mixture is recommended, and is practicable in the case of young palms. Assuming that the cause of the disease is correctly determined, this offers a striking illustration of the possible differences in the effects of the same fungus on the same host in different countries.

Uprooting Jungle Stumps.

By T. Petch.

A correspondent writes from South India :—

"May I bring to your notice a plan carried out by a neighbour of mine, which is most successful. He first cuts down all the small trees; the large ones are then tackled. The roots round the tree are cut through, and the weight of the top boughs brings the tree down with a crash completely uprooting the stump. In the case of large round-topped trees, the branches on *one* side can be lopped, and the tree thus made to fall in any direction. This is in my opinion a much cheaper and more satisfactory method than first felling the tree and then digging up the stump. On the Nilgiris most of the forest trees are surface rooters, and I expect it is the same with you; this makes the plan I mention most efficient.'

The method is, of course, not put forward as a new one, but it is one which might be adopted with advantage in future clearings.

Entomological Notes.

By E. Ernest Green, *Government Entomologist.*

In a valuable paper on 'The Principal Insects Attacking the Coconut Palm,' by C. S. Banks, published in the Philippine Journal of Science, Vol. 1, Nos. 2 and 3, mention is made of a native treatment employed against the attacks of the Rhinoceros beetle. This consists in placing sand and coarse salt in the crown of the tree. 'The Filipinos state that the sand gets between the articulations of the head and thorax of the beetle where the constant friction sets up an irritation which eventually punctures the soft tissues, after which the insect dies.' During a recent visit to Trincomalie, I was interested to find that a similar theory is maintained by the local coconut growers. The practice seems to be a sound one, and it might be employed with particular advantage on all young coconut estates. Besides the placing of sea sand in the crown of the tree, no better material could be employed for filling up the holes after the extraction of the beetles. The loose gritty sand prevents the reoccupation of the holes by other beetles—either Rhinoceros or Red Weevil.

A new species of Shot-hole-borer has been noted. It has, at present, been observed only in a single tea nursery, and immediate steps for its eradication were taken, by the cremation of all the plants. The insect is a Scolytid beetle, very similar in appearance to *Xyleborus fornicatus*, but considerably smaller in size, The following measurements will give an idea of the comparative sizes of the two species:—

Xyleborus fornicatus, length of female			2·25	millimeters;
		male	1·50	do.
Xyleborus (new species), do. of		female	1·75	do.
	do.	male	1	do.

There are other minute distinctions which can be detected only by the aid of a microscope. The point of attack is near the ground, just above the collar of the plant. The galleries run longitudinally up and down the pith of the plant, with a single transverse circular gallery at the point of entry. They appear to be more densely crowded with insects in all stages than are those of *X. fornicatus*. In every case the plant had been killed at the point of attack, the root remaining healthy and the upper part of the stem often still green (in cases of recent attack).

If unchecked, this insect might possibly become a serious pest. Owners of tea nurseries should be on the watch for its appearance. In the event of its occurrence, no half measures should be permitted; but the whole nursery should be sacrificed.

We have always been led to suppose that camphor wood was immune to insect attack. But our confidence is apparently misfounded. I have recently received specimens of camphor branches attacked by a Scolytid beetle, distinct from but apparently allied to the 'Shot-hole-borer' of the tea plant. The insect perforates branches of over one inch, down to twigs of less than a quarter inch in diameter. The bark, for some distance above and below each point of attack, is discoloured (deep brown). The discolouration penetrates into the wood. In deserted galleries—in the larger branches—the central woody area is dead and decayed, but the bark appears to have recovered and to be carrying on its normal functions. Smaller branches are often killed outright. The galleries of the insect are transversely circular and restricted to that one point. They do not run up or down in the branch. The beetle has a bright reddish head and thorax, with the hinder parts (abdomen

and wing cases) blackish. Each gallery was found to contain a single female and many larvae in different stages of development. No males were observed. The infected tissnes still smelt strongly of camphor, showing that this substance causes no inconvenience to the insects. It is fortunate that our system of cultivation provides an efficient check to the increase of the pest. Our camphor is distilled from the leaves and young branches of the plant. All affected branches (the marked discolouration of the bark makes their recognition easy) should be cut out and passed through the still as soon as possible. It is probable that the beetle is breeding in some allied jungle tree. The 'Kudu-dawulu' (*Litsea zeylanica*) and the various wild cinnamons may prove to be the natural host plants.

The caterpillars of a common moth (*Prodenia littoralis*) have been sent in by a tobacco grower. They are said to eat large holes in some of the best leaves. Hand picking is the only practical remedy in such cases. At the first appearance of a hole in the leaf, the plant should be thoroughly searched and the depredator will usually be discovered sheltering beneath one of the leaves. During the heat of the day they retire to shadier parts of the plant.

Gourds, cucumbers and vegetable marrows are often spoiled by the presence of maggots in the fruits. These are the larvae of the 'Cucumber Fly' (*Dacus* sp. which lays its eggs in the young fruits. The only satisfactory method of dealing with the pest is to cover the fruit—immediately after it has set—with muslin bags large enough to contain the mature fruit. This would be difficult with some of the larger gourds; but in such cases the bag might be removed when the fruit is only partly grown, as by that time the rind has become fairly thick and will be able to repel the attacks of the fly. All infested gourds and cucumbers (recognizable by the exudation of a gummy matter) should be at once collected and destroyed. If allowed to rot on the ground, the flies will mature and give further trouble.

Small grasshoppers are reported to have given trouble in some nurseries of Para rubber, by nipping off the young seedlings. Injury of this kind could be prevented by dusting the young plants with a mixture of one part Paris Green to six parts lime.

An up-country correspondent has written complaining of annoyance from mosquitoes in the bungalow, and asking for advice in their eradication. The only way to be free of mosquitoes is to get rid of their breeding places. This should not be difficult in the hill districts, where there is little or no stagnant water.

Probable breeding places are :—

1. Tubs and tanks for catchment of rainwater.
2. Discarded chatties, pails and tin cans.
3. The hollow stumps of bamboos, in bamboo clumps.
4. The flowers of the 'Lobster-claw' plant (*Heliconia.*)

Tubs and tanks should either be made mosquito-proof by means of close-fitting covers, or treated periodically (once a week) with kerosene. A brush of rags on a stick, dipped into the oil and stirred into the tank, will produce an effective surface film and kill any mosquito larvae that may happen to be in the water. If the water is drawn off by means of a tap below the surface, no taint of kerosene will be observed.

Old chatties can be broken. Discarded pails and empty tins should be buried. The bamboo stumps should be plugged with clay or lumps of turf. 'Lobster-claw (*Heliconia brasiliensis*) is a favourite shrubbery plant and produces its blossoms in handsome scarlet concave bracts which retain considerable quantities

of water in rainy weather. They are a frequent but usually unsuspected source of mosquito infection, especially of the small, striped day-flying species (*Stegomyia scutellaris*). If the foliage of the plant is required for a screen, the flowers should be cut off as fast as they appear.

During the months of October and November enormous numbers of a common brown moth (*Oxyodes scrobiculata*) were on the wing. They occur, about this time, every year, and appear simultaneously all over the Island. The jungles are alive with them, and they seem to be equally plentiful in grass land and scrub. The large electric arc lights in Kandy were bombarded by them each night during the flight. I have received specimens from numerous correspondents who reported that they were swarming among the tea, giving rise to the fear that they might be a new tea pest. It is remarkable that, in spite of the abundance of the moths year by year at this season, the caterpillar is undescribed and unknown. It probably feeds upon some common weed. If it had a taste for tea, its depredations would be so apparent that the caterpillars must have been discovered before now.

An outbreak of the 'Arrakkodyan worm' (*Spodoptera mauritia*) occurred in the Mullaittivu district early in November.

LIVE STOCK.

Poultry Notes.

By G. W. Sturgess, M.R.C.V.S.

DISEASES OF POULTRY.

Dropsy.—Occasionally cases of abdominal dropsy are seen, especially in hens—probably the result of unsuitable feeding and liver derangement. The hinder part of the abdomen will be noticed to be very much swollen and the presence of fluid contents can be easily detected.

Treatment.—The diet should be completely changed. A little Fowler's solution of arsenic and Iodide of Potassium may be given daily in the food. The swelling may be tapped by a trocar and canula and the fluid drawn off.

Egg Bound.—This term is applied when the hen from some cause is unable to pass the egg. It may occur in the case of a pullet laying the first egg, or if hens are over fat, or if the egg is a large double yoked one, or abnormal in any way.

The symptoms are uneasiness, frequent visits to the nest, straining, drooping of the wings. On examination the vent is seen to be swollen and inflamed, and the egg is easily felt with the fingers.

Treatment.—All that may be necessary is the passing of the finger or a feather dipped in salad oil or melted Benzoated lard, and the hen put on the nest and left a short time. If not successful, the vent may be held over steam from hot water or fomented by a sponge and warm water, and a dessert or table spoonful of salad oil or melted lard mixed with a very little extract of Belladonna gently injected into the vent by a syringe. Great care must be taken not to break the egg inside, as such an accident would cause death from inflammation.

If all these simple measures fail the egg may be gently forced towards the vent until it can be seen and punctured, the contents removed and the shell gently squeezed and collapsed or taken out piece by piece, and care being taken to see all particles of shell are removed. If there is eversion at the vent the parts should be gently washed with warm water in which a little Boric acid is dissolved, and dressed with sweet oil or lard in which is mixed a little laudanum and replaced.

A dose of physic should be given—Epsom salts, Calomel, or Jalap, and the diet be low for a few days after a bad case.

Soft Shelled Eggs.—Hens may lay soft shelled eggs from fright, or a deficieny of lime salts in the food, or over feeding and stimulation.

Treatment.—The feeding should be changed and a few doses of Epsom salts given to cool the system. Powdered oyster shells should be given to provide material for the shells.

Blood or Dark Spots in Eggs.—Sometimes in the yolk or white blood spots may be noticed due to small haemorrhages in the ovary or oviduct indicating, that a course of cooling medicines and diet is necessary. If the spots are pronounced and dark there is some disease of the ovary or oviduct, and such birds should be kept in isolation and observed. Any eggs showing such dark spots should be sent (the hen also if possible) to a bacteriologist for examination.

Crushing Versus Castration in Ceylon.

BY T. B. POHATH-KEHELPANALA.

I beg to supplement my paper *re* "Crushing of Cattle by the Kandyans,' by the following note :—

Protests are made by some Kandyans against buffalo-castration, alleging that the new practise results in the premature death of the animal, and tends to degenerate their condition and endanger the agricultural industry of the country. The old form of "*crushing*," they urge, which they have practised from ages past, is the best and safest method. I believe that castration is preferable to crushing, in that it gives less pain to the animal and is followed by a considerably speedier cure than in the case of the "crushed" animal. I disagree that castration causes early deaths, or that it undermines the strength of the animal.

In 1905, 1,518 head of cattle were operated upon by 65 trained men of the Veterinary Department. With the exception of a few fatalities, all the cases proved successful. The Society voted a sum of Rs. 1,500 for the surgical operations. But I confine my remarks to *buffaloes;* and among the number that underwent the operation, perhaps a large number of *black cattle* has been included.

I should think, however, that buffalo-castration is detrimental to the Kandyan agriculturist in certain respects. Castration puts a dead stop to breeding, while the crushed animal is capable of generating, and thus the country will not run short of good stock. I am speaking of those buffaloes whose glands are not *entirely crushed,* but a small portion of whose glands is left unsqueezed. Buffaloes, whose organs are entirely crushed, are few and far between.

Again, the castrated animal greatly slackens his progress during levelling and ploughing the fields. The reason is not far to seek. In the working of paddy fields, it is the general custom to urge the animal to move faster and to take the proper turns, by the application of the *goad, more to the organs,* than to the back. The testicles are very ticklish, naturally, and are sensible to the slightest touch, and buffaloes are never stirred to quicker work than by this process. What is left in the glands of the castrated-animal is merely the bare skin. It is devoid of any sensitiveness. Apart from this, the continuous goading might injure the healed wound or even the abdomen of the castrated animal. The crushed animal has partially-fleshy glands. Castration is decidedly effective for cart-bulls.

MISCELLANEOUS.

Suggestions for the Encouragement of Indigenous Arts and Crafts in Ceylon.

BY ANANDA K. COOMARASWAMY, D. SC.

One of the chief results of the exhibition of Ceylonese Arts and Crafts, organized by the Ceylon Agricultural Society, and under the present writer's immediate charge, was to show that these arts and crafts, though decayed and in danger of still greater degeneration, do survive, and that there are still men who have learnt the old methods and are capable of doing work as good, or almost as good, as the best mediæval work; but they are not sufficiently encouraged, and there is a lack of sympathy and understanding for their work amongst those who should be its first and principal patrons. Under the old regime there was an elaborate system of royal patronage, practically a public department of arts and crafts, whereby a considerable portion of the public revenue was expended on the erection of buildings and the encouragement of craftsmen. The superior craftsmen were men of position and importance, having lands and slaves of their own, and treated with a good deal of consideration and respect.

More important still, the conditions of their work were different, especially in the respect that they were allowed to take their full time over any important work; the chief expressed regret of good workmen now is, that they are only able to undertake comparatively petty work, and are asked to do it quickly, and are often inadequately paid, especially if the work has been given on contract, in which case the middlemen usually get most of the profit. In old days a man might devote a very long time to his work, and, if it were excellent, would be rewarded, not with a daily wage, but with gifts of clothes, oxen, money or lands; and also with intelligent and not uncritical appreciation. The indigenous arts have been more seriously affected by the decay of national architecture than by any other single cause.

I have above referred to the expenditure of money on public buildings, which went on under the old regime and of which we see the result in such remaining architecture as that of the Dalada Maligawa, the Old Palace, and viharas such as Lankatilaka and Gadaladeniya. But all modern Government buildings are in a style foreign to the country, a style so foreign that the local style has no possible part or lot in them. They are, moreover, for the most part distinctly ugly. The people of the country have not been slow to imitate the European style thus placed before their eyes, with the result that most modern native houses are badly built and ugly to behold, besides being rather less comfortable than the old. Thus, not only is native capacity neglected by Government but also by the people themselves. But, all arts are the handmaids of architecture; and when architecture is degraded, so are the minor arts. "It is particularly," says Sir George Birdwood, "*through the neglect of native architecture and the propagation of a bastard English style, blindly followed by the people themselves, that the Government threatens the slow destruction of the historical handicrafts of India.*" The same is the case in Ceylon where also "it is not yet too late for Government, by the encouragement of native hereditary architects, not only to arrest the decadence of the arts—but to promote their revival." It is true that some indirect efforts have been made in this direction in the case of certain ambalams and of the Kandy bandstand. I have, however, elsewhere shown that the architecture of the said ambalams is no more than a caricature of real Kandyan architecture, standing to it in the same relation that a modern tabernacle does to a mediaeval church; and the influence of this degraded

architecture is positively harmful. It is futile to suppose that satisfactory architecture of the old kind can be had by putting out the work on contract; the chief part of the profits then go to the middleman, and the workmen are so hurried and stinted as to make it impossible for the best work to be done. Very often it happens that low-country workmen, out of touch with tradition, are thus employed by the contractor, who is subject to no real check, and there remains nothing of the spirit of national architecture in the work, but only the outward semblance.

Taking the Ruanwella Ambalam as an example, and beginning with the roof:—pains have been taken to use flat tiles (not however made locally, but brought from the low-country, in fact from All Saints', Colombo;) but the eaves-tiles are not the real thing at all, but simply the ordinary roofing tiles *nailed* round the eaves! Seeing that special and very beautiful eaves-tiles were made (and were obtained for the Kandy band-stand even) it should have been possible to get them here too. Take next the moulding round the wall, a few feet from the floor; instead of forming an actual part of the wall itself, covered with plaster afterwards, this moulding consists entirely of plaster, applied to the wall surface. This is a shameful piece of jerry-building, and as a natural result the moulding is already breaking away. Fine large pieces of jak have been got for the pillars, but the carving is wonderfully thin and poor, and *all the pillars are the same;* in good old work it rarely happens that even two sides of one pillar are alike in every detail. The bars, bolts, and handles of the doors are of poor design and contrast unfavourably with older work.

But perhaps the worst feature is a part of the doors themselves. The contractor has observed the massive arched lintels of Kandyan doors, and by way of imitation *has fastened on to each half of the door itself* thick pieces of wood so cut as to represent an arched lintel when the doors are closed. This is a miserable bit of imitative deception, and not even that when the doors are open. The only satisfactory method would be the old one of making certain chiefs responsible for the execution of certain work; or, perhaps better, the direct employment of the best workmen by Government, supervised by an official really familiar with the national style and sensitive to any degradation of it. One other simple step, and an inexpensive one, would be of value; that is the granting of certificates to competent men, and their registration as such. These certificates could be granted by the Government Agent, and would check the employment of ignorant and unskilled men; for the Chairman of the Buddhist Temporalities Committees would be in a position to insist on the employment of these men only, and the same would be the case when work was done directly for Government, whether through a contractor or otherwise; *i.e.*, a contractor, if employed at all, should be compelled to himself employ only certified workmen. It is quite certain that, unless the national architecture can be at least partially revived—by which I do not mean a slavish antiquarian copying of old forms, but rather a preservation of the old feeling, and the employment of men who have been through the traditional course of instruction —the minor arts will continue to degenerate and to satisfy only the trivial needs of the casual visitor.

It remains to consider the possibility of *directly* affecting the prosperity of the minor arts. The prime necessity is to once more awaken the interest of the people of the country in these things; but in the meanwhile they must be kept going somehow or other. I am inclined to think that what is immediately required is some direct assistance from Government with a view to increasing the production of the work of the best quality and making it accessible to purchasers. The former state of society in which the arts and crafts prospered so much, cannot be restored; but the expenditure of public money on national architecture, crafts and craftsmen may be regarded as a precedent which should be

more closely followed than has been the case hitherto. It is, in fact, desirable that Government should take immediate steps, either directly or through the Agricultural Society, to support the indigenous arts and crafts and to save them from extinction or degeneration.

And now let us speak shortly of the decorative arts. The capacity for good decorative work which still survives in Ceylon is very remarkable ; there are minor arts which the Colony can ill afford to lose, and which will stand its people in good stead if ever industries such as silk-weaving are introduced. It is in fact the case that a determined man with sufficient capital at his disposal could, with the aid of such workmen as are available, and of others trained in the same way, establish or re-establish the sumptuary industries of India here and secure a world-wide market for the work. If there existed amongst the ordinary workmen in England men with the capacity for designing which is found in the Ceylon craftsmen, the value of those men to English manufactures would be incalculable. It therefore appears that the Government would be fully justified in spending a moderate sum of money annually in support of the indigenous arts and crafts. What is wanted is a certain amount of capital which can be expended, without a necessity for an immediate return, in securing the execution of more elaborate and more expensive work than a small association such as the Kandy Art Association can afford to keep on sale. The things so made must be accessible to the buying public ; I am thinking of elaborate painted boxes with metal fittings, requiring the co-operation of carpenters, painters and founders ; illuminated manuscripts ; carved ivory and woodwork of a more substantial and useful character than any now made ; but not so much of ordinary hammered silver and brass work. The buying public ought of course to consist of the people of the country ; but, failing that, it would be necessary to rely upon the European residents and the passenger trade to a considerable extent. It is true that the passenger is rarely a judge of good or bad work ; but it would be the concern of those connected with the undertaking to see that none but good work was to be had, and that it was sold at reasonable fixed prices. The work of the Kandy Art Association in this direction is of course excellent, but it is insufficient. The fact that passenger shops in Colombo keep on sale goods valued at as much as £100 shows that buyers of really expensive and good work are not altogether wanting.

Perhaps the most important (and also most expensive) part of any comprehensive scheme would be the selection of a more or less permanent officer, of necessity a cultured and sympathetic man, to organize the production of work for the depot. The whole success of the scheme would hang upon the selection of the right man.

Another important thing in connection with any such efforts as that proposed is the selection only of the best workmen. There are many moderately good and some very good, and it is the latter who should be specially supported. One good man is worth a dozen moderate ones.

It would be necessary to have the work on sale in a convenient part of Colombo ; either a special shop could be arranged for, or an already existing firm might at first be allowed to sell the work on commission at fixed prices. Something like the 'Peasant Art Society's' shop in London is suggested. A good many rich and appreciative passengers do pass through Colombo every year, but are often deterred from spending money there on account of the impossibility of obtaining any really distinctive Ceylon work except of a trivial character, and by fear of being imposed upon. I have no doubt that, as soon as their confidence was secured, and it became known that good work, guaranteed as such, and not too cheap, was available, sufficient purchases would be made to support the undertaking. Another point is that there are many useful articles made or capable of being made in Ceylon outside the Kandy district, and these the public have at present no opportunity of obtaining.

I do not, however, think that the undertaking should stand or fall according to the possibility of commercial success, but rather that the Government would be fully justified in expending money without immediate return. The amount of money spent on the Technical College for instance is large, but the amount of industrial instruction in the arts and crafts given is after all small, whereas a tithe of the same expenditure devoted to the support of the already existing crafts would have definite and real results and preserve for the Colony what is in reality a very valuable asset, and one daily growing rarer and rarer throughout the world, viz., the capacity amongst workmen for sound decorative design.

"It is the case without doubt that the influence of European domination and civilization is being felt in every direction and operating often very injuriously on the arts and crafts of the country." (Sir George Watt). While this is so, and while it is still not too late to do something to preserve what still survives, it seems to me to be the clear duty of Government, acting in the best interests of the Colony, to have greater recourse to native architects, working under fair connditions, when the smaller public buildings are required, and to set on foot some organization for the more convenient ordering of the production and sale of well-made, substantial work by the best surviving workmen. I do not think these views are at all Utopian. Europeanised Ceylon is of course a long way behind England in some respects; in matters of taste, lingers still in the early Victorian period; but this cannot last for ever, and it will be a sad thing if when public taste improves, the workmen who have been hitherto faithful to a former style are gone for ever.

The Use and Objects of Agricultural Societies.

By E. B. Denham.

The Ceylon Agricultural Society was founded by His Excellency the Governor in November, 1904. It has to-day 1,120 members and 45 branches with a membership of approximately 3,500. The progress report tabled to-day shows the number of interests and industries the Society deals with; while, if further proof of its activity is required, members can see for themselves the different exhibits sent in by local branches and members of the Society to this exhibition. The usefulness of the Society has been, I venture to think, abundantly demonstrated by the success of the many agricultural shows held this year and last and by the keen interest displayed in all agricultural subjects. His Excellency's well-known desire to encourage and promote all branches of agriculture has been the principal cause of the increased interest in the subject which has now shown itself in the formation of branches, in the holding of shows, in agricultural discussions and debates. Agriculture has been in the air, and agriculture has been well advertised. It has been advertised in the vernacular as well as in English. The native press have played a very considerable parts in assisting the Society to explain its object to the "goiya" in his own language. The "Dinakaraprakasa" and the "Sihala Samaya," two of the leading Sinhalese newspapers, record fully in Sinhalese the proceedings of the Board and the papers read before it. The editors of these papers send 100 or 200 free copies of the issues ontaining these proceedings to the Secretary of the Ceylon Agricultural Society for distribution, and these are sent to the local branches. All the leaflets of the Society appear in Sinhalese and Tamil as well as in English; the "*Tropical Agriculturist and Magazine of the Ceylon Agricultural Society* has a Sinhalese edition, "The Govikam Sangarawa," edited by Mr. C. Drieberg, an officer of much experience in all agricultural matters; and a Tamil edition, "The Kamal Thoti Velakkum," published by the Jaffna "Hindu Organ." The proceedings of many of the branches are conducted in the vernaculars. It is important to emphasise this point, for the Society's utility depends on its being able to reach those who, from their ignorance of the English language, are unable to drink of the fountain of Peradeniya. To

Peradeniya all agriculturists must look for improved knowledge, for the results of the careful study of science, for the data for all experiments, and on no one more than the Director of the Botanical Gardens and his staff must the Society depend for success. The Society is intended to be the interpreter of the Botanical Supreme Court. The Chief Justice, the Director, has arraigned before him a hapless goiya accused by science—represented by Mr. Kelway Bamber with a tobacco plant, or Mr. Petch with a bud-rotted coconut palm—he is charged with gross neglect of all scientific methods of cultivation and with pursuing the methods of the iron age. His excuse, murmured in Sinhalese, is ignorance. The Judge orders a Peradeniya Circular to be administered. Excellent as is the remedy, the case of the villager reminds one of the English labourer, who according to "Punch," begged of the physician that the pills might not be packed in such solid boxes as he found them difficult to swallow. With all the wealth of knowledge that this island is so fortunate as to possess at Peradeniya, any agency for disseminating the knowledge must be useful, and such an agency the Agricultural Society endeavours to supply with the help of its local branches. The Society has now as its magazine the "*Tropical Agriculturist and Magazine of the Ceylon Agricultural Society*," edited by Dr. Willis, with a reputation second to none among the agricultural journals of the East. Every member of the Society gets the magazine.

I have touched at present only on the literary side of the Society's efforts, not because I consider them the most important, but because they are the only side which presents itself to the large majority of the general public. The work done by the local societies can only be realised at first hand, it can only be accurately gauged by personal inspection. By the *work* done by its members the Society must stand or fall. Many of its branches are, I fear, little more than debating societies, where "village Catos give their little Senates laws and sit attentive to their own applause." But even these, if they allow of the exchange of ideas and the records of experiment may be of some use—that they are deserving of more praise I am not prepared to say. But other and practical work has been done—vegetables have been planted out, experimental gardens opened, and demonstrations in castration held. In several places *working members*' branches have been started—the first of these was in the Kuruwiti Korale, where 32 villagers joined, 22 of whom gave a donation to the branch in addition to undertaking an experiment. R11·25 was paid in subscriptions by villagers. These branches have as their rule of membership that a subscription is voluntary, but that every member must, as a condition of membership, undertake to carry out some piece of agricultural work—*e.g.*, either open a plot of ground with vegetables, plant chillies in his garden, transplant the paddy in his field, or try seed paddy from another district. Another useful means of improving agriculture has been the distribution of manures, supplied free by Messrs. Freudenberg & Co., to members whose names are sent in by the local branches. By this means a series of useful experiments are being made all over the island, which will afford most valuable data, and at the same time introduce the principles of manuring in places where manures have hitherto not been used. Village shows have been inaugurated by the Society; a most successful one was held at Minuwangoda, a report on which by Mr. C. Drieberg, has appeared in the Society's magazine. These shows are held on market days at important village centres, and the prizes are subscribed for by members of the local society. Judges are appointed who go round the different booths and stalls and make their awards. In to-day's report mention is made of one of these shows which was arranged for at a meeting held at Ruanwella. The show will be held at the Yatiyantota market and, as will be seen from the progress report, 26 prizes (nine of ten rupees, and seventeen of five rupees) have been subscribed for by members of the branch. All the prizes are to be given for well-known native vegetables and cultivations—the object being to improve and increase the varieties. In a paper like this it is only possible to touch on a very few of the subjects with

which the Society is endeavouring to deal. Members who have perused the Progress Reports published monthly will have noted the efforts of the Society to establish new varieties of paddy from India and Japan—the introduction of new products, such as date palm suckers, new varieties of yams from the West Indies, the encouragement of cotton cultivation in chenas, and distribution of vegetable seeds; the efforts to establish a sericulture industry, and the work done in castration of cattle by the Government Veterinary Surgeon and his staff—particulars of which can be obtained from paras. 16 and 17 of to-day's Progress Report. All these subjects have had the attention and encouragement of Your Excellency and the members of the Board. The use of the branch societies as co-operative centres for experiments and for the adoption of the co-operative credit system is another side of the Society's work.

The usefulness of the Society justifies its existence, the success of its objects would alone justify its extinction. The objects of no society can be achieved until that society is rendered unnecessary. The usefulness of the Society, the worthiness of its objects none may dispute, but, however useful the machine may be, however sound the objects for which it is intended, it can never prove its use and succeed in its objects until it is worked under the best conditions and proved to be generally and practically useful. As is asked of every invention, how long will this principle be admitted—will it not be pronounced obsolete or even absurd in a few years' time? So it is with this Society; we must ask ourselves how far its elements are transitory, what are its sources of strength and of weakness; is its permanence assured? The Society is a voluntary one; many of its members are no doubt attracted by the knowledge that its President, His Excellency the Governor, takes the greatest interest in its working and encourages its efforts; others by the fact that they receive an excellent magazine at a low cost. But it is not on any individual member or any class of member that the Society depends for a continued course of usefulness. This must depend on the local societies and the work done by them. No amount of Board meetings, of discussions, of leaflets or magazines can save the Society, if it is not in touch with the local cultivator. The question is: How can it keep in touch with the great mass of the population of Ceylon? Only by making itself heard in a language that they can understand. The Society, as I have said before, is intended to be the great Agricultural Interpreter—it must have many interpreters working under it. These interpreters must go out into the highways and byways and preach improved systems of agriculture. Just as the school gardens are intended to be centres of agricultural demonstrations, to teach villagers how to lay out a garden and what to plant in it, so should the agricultural instructors be men who are able to explain the systems of cultivation the gardens are intended to demonstrate. It is on its agricultural instructors that the success of the Society as a popular exponent of agricultural truths must depend. No information can be more usefully imparted than by practical demonstration. The agricultural instructors must, then, be men who will take their coats off and show the villager how to carry out experiments. It is not so necessary that they should be disciples of any particular school of foreign thought on the subject of tuberculosis in plants, as that they should have learnt to use their eyes and their hands. They should be at first rather agricultural inspectors than instructors, reporters of facts rather than repeaters of platitudes. If these men would only collect or report on any specimens of disease caused by insect, or fungus I am sure that they would prove most useful assistants to Mr. Green and Mr. Petch, as well as render great benefit to the country. It is most important that the right stamp of man should be obtained for these posts; they must be capable both of working themselves and making others work, possessed of influence as well as taking an interest in their work. I need not say more as to their requirements, for it is on *their* instructors that we must depend for securing and training the right stamp of men. It will not be

one of the least benefits that Peradeniya has bestowed on Ceylon, if the Director of the Royal Botanic Gardens and his staff can train young men, who will be imbued with a sprit of enthusiasm for their work and who will be anxious to do their utmost in the interests of the different cultivations of the Island. The Agricultural Society and its branches should further offer a wide field for the collection of agricultural information; all experiments and their results should be carefully collected, reports of unusual yields, of diseases, of unexpected failures should all be recorded. Analyses should be made of soils which call for special report on account of the results obtained from them. Detailed information should be procurable by every European and native planter of the crop grown, the ressult, seasons, average rainfall, &c., of every district in which there is an agricultural society. The excellent work now being done by the Land Settlement Department could be most usefully supplemented by the work of the Agricultural Society. Selection of land of crops would be greatly assisted by the department with full and carefully prepared records. When we have seen what can be done in the collection of beautiful articles to illustrate the arts and crafts of different districts, we can see no reason why equally successful attempts should not be made to procure detailed and useful statistics of the different cultivations. To site only one instance where there is a great need for such detailed information—the North Central Province. The experiments now being made at Maha Iluppalama in rubber cultivation under irrigation, in cotton, Indian grains, and vegetables can all be most usefully supplemented by the work of local societies in the North Central Province. A guide to the crown land in the North Central Povince, North Western Province and Northern Province, giving details of crop grown, analyses of soil &c., might prove of great assistance in solving the problem of the development of the route through which the Northern Railway runs. Again, a staff of agricultural inspectors or instructors working through the villages should obtain most useful information for those thinking of purchasing land in the vicinity. The importance of obtaining information relative to the different soils, situation, &c., of land is, of course, well recognised in India, as on its careful compilation depends the successful collection of the land tax.

The lines of work I have endeavoured to sketch out are, it may be said, rather those of a Department than of a voluntary society. Can the Agricultural Society as at present constituted, undertake this work or is it first necessary that it should be made into a Department? In its begining the Society was necessarily a voluntary one, an experiment which has, I venture to think, been fully justified. If it is to expand on the lines which such a Society should naturally take and, which I have ventured to sketch very roughly, it must, I think be worked by a Department. What form that Department should take it is outside the subject of this paper to attempt to sketch. In some parts of India we find Departments of Agriculture and Land Records, in other Deparments of Agriculture and Commerce, in others Departments of Arts and Crafts. But it may be asked whether after all Agricultural Societies are necessary if there is a Department of Agriculture. My answer to this question would be, certainly yes. Agricultural societies are local councils which should enable the people to meet together under their recognised leaders for discussion and exchange of ideas. The principles of societies are thoroughly well understood in the country They are natural agencies for the exchange of ideas and they allow the natural leaders of the people to take their proper place in directing them by their energies. The Agricultural Society can be productive of nothing but good, whatever its final stage may be. Under the direction of His Excellency the Governor, with whose name it will always be associated, we can have no doubt of its stability and the value of its objects, or that those objects will not be the most practical ones.

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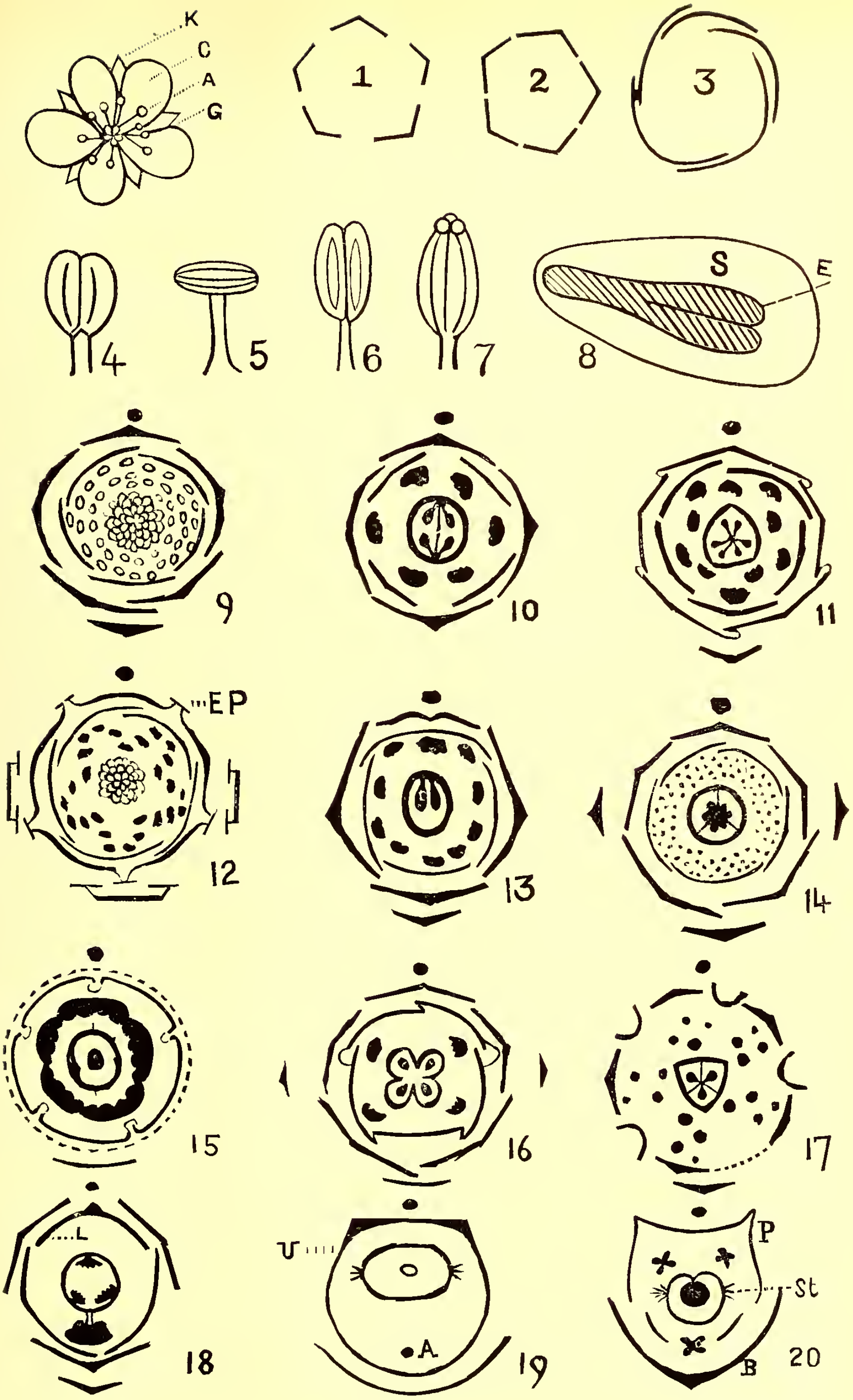

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Lessons in Elementary Botany. VII.

By J. C. Willis.

(*Illustrated.*)

A very useful method of expressing many of the important features in the structure of a flower is a Floral Diagram. It represents an imaginary section through the bud, taken (if such were possible) so as to pass through the ovary and anthers and through the parts of the perianth where the æstivation is most clearly shown. With the exception of the hypogyny or epigyny, the diagram shows most of the characters that are usually necessary for the identification of the natural order to which the plant belongs, and is hence of much use in classification. A number of diagrams are given on plate IV. and should be carefully compared with actual flowers belonging to those orders.

In drawing a diagram we put in at the top the original stem on which the flower is a branch, and at the bottom the bract, to give the exact orientation of the flower. Bracteoles if present are also put in. Then follow sepals, petals, stamens, and carpels in their exact relationship, as to position, overlapping (if any), cohesion (if any, marked by loops joining the lines representing individual sepals &c,) adhesion (if any), placentation, &c.

Floral Formulae afford another convenient way of expressing many features in flower construction. The calyx, corolla, andrœceum and gynœceum are represented by K., C., A., G., respectively. After the letter follows the number of parts, and if they be coherent it is enclosed in a bracket. Thus K. (5) means "Calyx of 5 sepals, gamosepalous," A 3 means "andrœceum of 3 stamens, polyandrous." If there are two numbers with a + sign between them, it means two alternating whorls. *e.g.*, A 3+3 means that the andrœceum is of 2 whorls of 3 stamens each. The ovary if superior is represented by the symbol $\underline{G}$, if inferior $\overline{G}$

12 floral diagrams of the commonest families of Ceylon upcountry plants are given on plate IV., and should be carefully compared with actual flowers.

NATURAL HISTORY OF THE FLOWER.

Darwin showed that the offspring of cross-fertilisation, *i.e.* A × B (where A, B are different plants) was in general superior to that of self-fertilisation (A × A) and most plants make effort to get their flowers fertilised from another plant of the same kind.

The general agents, external to the flower, which can carry pollen from one flower to the stigma of another, are wind, animals, and water.

Wind-pollination occurs in the grasses, sedges, and other plants. The flowers are usually inconspicuous, not needing to attract insects, and produce large quantities of powdery pollen which easily blows away and may be carried to a stigma. The anthers of such flowers are usually large, and often project beyond the flower on thin, easily shaken stalks, so as to give the wind a better chance. The stigmas are very commonly large and brush-like, to have a better chance of catching the floating pollen.

(To be continued.)

Sanitation on Estates and the Health of Coolies.

The Disease Anchylostomiasis or Dochmius Duodenalis.

The cause of this disease, which is very prevalent in the planting districts, is a small intestinal worm ; its spread is due to want of proper sanitation.

The eggs of the worm, or the recently hatched worms themselves, gain an entrance to the human subject either by the skin, or are swallowed.

The disease is spread by soil or water contaminated by the excreta of persons suffering from the disease.

The measures to be enforced to check the spread of this disease fall under four heads :—

(1) The proper disposal of night soil (excreta).
(2) Protection of the legs and feet.
(3) Pure water for drinking and washing purposes.
(4) The segregation of all cases in hospital until cured.

Under the First Head : it is necessary for Superintendents to prohibit coolies from fouling the soil indiscriminately, and to carry out this prohibition latrines should be built on every estate, and coolies who do not make use of them should be punished. The night soil should be collected in buckets and buried daily in a part of the estate away from dwellings and water-courses.

Under the Second Head : means should be employed to protect the legs and feet of coolies, for the worms which are in the polluted soil find their way into the system through the skin, and are often the cause of ulcers so commonly seen on coolies legs. A cheap form of boot worn outside putties would afford protection ; in some countries tar covered with sand is applied to the feet and legs.

Under the Third Head : at present water-courses and bathing-places are contaminated by the surface drainage of the soil being washed into the water after rain : means should be taken to see that this cannot happen. The water used by coolies for cleaning themselves after a call of nature should not be allowed to run into the drinking or bathing supply.

Under the Fourth Head : it is quite impossible to admit every cooly with anchylostomiasis into hospital and to keep him there until cured, because the disease exists in nearly every cooly on every estate, and the hospital accommodation is insufficient for them ; but as far as possible coolies will be admitted and retained in hospital until they are cured, and will be put under a new treatment that has recently been introduced into the Island. (Medical Officers will refer Circular Letter to Provincial Surgeons of the 27th June, 1906.)

As long as the present insanitary condition as regards disposal of sewage etc., on estates continues, there is little encouragement for Medical Officers to cope with this disease, because, when cured, patients get re-infected on the estates soon after their discharge from hospital, and the whole business has to be gone through again *ad infintum.*

The above remarks will be met by the statement that the suggestions are totally impracticable of being carried out: the answer to which is that they are not impracticable provided those in charge of estates will spend a little money to improve the condition of their coolies. The return for the expenditure will be a more efficient labour force.

ALLAN PERRY,
Principal Civil Medical Officer and
Inspector-General of Hospitals.

Colombo, September 29, 1906.

Correspondence.

THE NORIA PUMP.

Sir,—I do not think that Mr. Saravanamuttu is correct in stating ("*T.A.*", Vol. XXVII., p. 317) that the "Noria" pump tried last year at Vasavilum was found to lift too great a quantity of water at one time, so as to make it useless to the cultivator, and the well run short of its supply in a short time. Before the pump could be given a fair trial, the enterprising importer became involved in litigation with some of the more conservative shareholders who objected to the innovations, and he retired to Negombo, after successfully defending the case, and no further experiments have been made. Apparently the fact that he had to pay his own costs combined with the prospect of further opposition disheartened him.

My recollection is that he informed me that it was necessary after using the pump for some time (I forget how long) to wait for 20 minutes for the well to fill again, but an interval of 20 minutes occasionally in irrigating would not be sufficient to make the use of the pump an impossibility. Further, all wells may not be the same as this well—one at Tirunelveli, a few miles distant, opened by Mr. N. W. Smith in connection with the Jaffna Waterworks scheme, seemed to have an inexhaustible water supply. It cannot be said that this well either was exhausted.

What is wanted is further tests, systematically conducted, with the results carefully noted. There has been no report of the kind with regard to this experiment, and without it, it is premature to condemn it as "useless to the cultivator." Mr. Thomas in his paper on the "Noria" pump in "*T.A.*", Vol. XXV., p. 606, does not give the practical results of the experiment.

J. P. LEWIS.

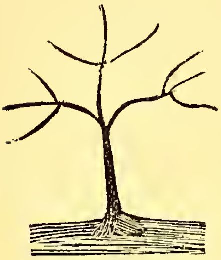
Kandy, 12th November, 1906.

PRUNING HEVEA AND CACAO TREES.

Dear Sir,—As (I think) the oldest pioneer in Para Indian Rubber cultivation, I should like you to allow me to corroborate Mr. Herbert Wright's views as to advantages arising by obtaining a standard form for the *Hevea, i.e.*, by the budding back of the terminal shoots of the young trees.

It was the method which I found best adopted to my Cacao, &c., &c., and, finding it so much to advantage, I carried it on to the young Rubber under my hand on the Rio Tapajos. At that period, however, one was as one crying in the wilderness: Indian Rubber cultivation was then looked upon as the most visionary of ideas, and

the Government of India had not as yet been prevailed upon by Sir Joseph Hooker to give me a free hand in the high forests of Alto-Amazonas, to enable introduction of the original stock from which the present generation of planters may work from.



I found the best method for Cacao, and also for Rubber, was to bud back the terminal shoots. That is to say :

3 primary and
9 secondary branches.

Thus to form a well-grown base for the tree to come, in the case of Cacao at 5 feet, in Rubber at 10 feet.

Very faithfully yours,
H. A. WICKHAM.

London, W.C., October 9.

TWO INTERESTING TREES OF THE NORTH.

DEAR SIR,—Among the most useful trees of the North are the two species of Balsamodendron (Commiphora) used for live fences, viz. :—

a. Canudatum (Kivilai) which is thornless.
b. Berryi (Mul-kilivai) which is thorny,

The chief recommendation of the plant is the ease with which the cuttings strike in an arid climate like the North, even in dry weather. The spined species is, of course, the more useful plant, offering as it does effectual resistance to stray cattle and goats. The latter, however, find the leaves of both varieties a suitable food especially when fodder is scarce. For this reason or from its habit of growth the trees appeared to me to be very scanty of foliage when I saw them in August.

The plants justify their inclusion in this balsam-yielding genus in as much as they possess the balsamic odour. Their most notable congeners are the well-known plants which yield myrrh (*B. myrrha*) and Balm of Gilead (*M. opobalsamum*).

If, as Trimen says, *B. Berryi* grows in Colombo, it is strange that it is not more used for fences, in spite of the alleged tendency of the plant to lose its spinous character in the low wet country.

There is apparently no definite Sinhalese name for either of these species though "Siviya," "Ensalu," "Masbedde" are given in Trimen's Flora as possible names of the thornless form. Why is it that Trimen spells the last syllable of the generic name "drum," while other authors give it as "dron"?

Guettarda speciosa (Tamil, Panir) is an ornamental tree, bearing sweet-smelling flowers, that grows well in close proximity to the sea. Like the "sorrowfu, tree" (*Nyctanthes acbro-histis*) so dear to Buddhists, it sheds its corollas which are used for distilling a kind of rose-water. Watt refers to the crude way in which the scent is got in India. In the evening a thin muslin cloth is spread over the tree so that it comes in contact with the flower. The cloth, wet with dew, takes in their fragrance, and the "extract" which is wrung out in the morning is sold in the bazaars.

Yours truly,
C. DRIEBERG.

MOSQUITOES AND ANTI-MALARIA CAMPAIGNS.

DEAR SIR,—In the September number of the "*Tropical Agriculturist,*" Mr. Green has drawn attention to the great success of anti-malaria campaigns in other countries and in our own colonies, and to the need for a similar campaign in Ceylon. No apology need be given for introducing this subject in an agricultural journal, health affects labour supply, and the question of labour supply is a vital one in all agricultural enterprises.

Ceylon prides itself in being an up-to-date colony, and certainly it is in some respects, in agricultural science for instance; but few will deny that it is sadly behind the age in sanitation and preventive measures generally. Lakhs of rupees are spent on the cure of disease, but how much on prevention? Would the sanitary state of the small towns and villages stand the test of a close inspection? An attempt is made by the Medical Department to deal with sanitation and prevention of disease, but the efforts are quite inadequate, nor can we expect anything else.

The staff of the Medical Department are not trained in the "prevention" of disease, "cure" is their province. What is wanted is a separate staff, properly trained, to see to the sanitation of all towns and villages, including estates, in Ceylon. Employers of labour, especially in the low-country, would surely welcome any measures obviously so much in their own interests. The only opposition would be from the ignorant and stupid. I believe in the case of the work done at Klang and Port Swettenham, in Selangor, Federated Malay States, also Ismailia, referred to in the letter given by Mr. Green, some of the staff of the Liverpool School of Tropical Medicine, were sent out to advise as to the best means of carrying on the campaign against malaria and other diseases of a preventable nature. Let the Ceylon Government take the same steps. The members of the staff would find a good field in Ceylon for their labours, and if any of them were of an investigating turn of mind, like Dr. Ronald Ross, of their school, whose researches have been of such incalculable benefit to mankind, they would find an interesting field for their investigations in the evident connection between the prevalence of malaria and the opening of clearings. That the Anopheles mosquitoes are a medium for the spread of malaria is an established fact, that they are the only medium is an open question.

One of the suggestions of the Commission might well be that more prominence should be given in schools to the teaching of the laws of cleanliness and sanitation. The sickness and death in low-country districts have this year been terrible. I have been told by a friend who has spent most of his life amongst low-country Sinhalese, and whose experience is not to be questioned, that a large majority of the deaths are preventable, they are due to the ignorance and apathy of the people.

The chief obstacle to the development of the country along the Northern Railway is its unhealthiness. Can nothing be done to mitigate this state of matters? Experience gained in other colonies goes to show that something can be done.

Yours faithfully,

PLANTER.

[We referred this letter to the Principal Civil Medical Officer, who remarks as follows.—ED. "T.A."]:—

"The question of improved sanitation is purely one of money—the small towns which have Local Boards of Health do as much as their funds will allow to improve sanitation, and the tendency is to advance on those lines. The officers of the local Medical Department are specially instructed in sanitation and in the prevention of disease, and they have to pass an examination in these subjects. Estate Superintendents can do a great deal by insisting on the prevention of fouling the soil, improving the water supply and the drainage of swamps. The suggestion of a special sanitary staff is good but hardly necessary—if money could be got for combating malaria, the present medical staff is competent to advise where the money should be spent.

It is futile to compare individual places like Port Swettenham, Ismailia, etc. with Ceylon as an island. Such places should be compared with Negombo or Kalutara. To tackle Ceylon as a whole is well nigh impossible, with its paddy fields, floods, lagoons, and swamps, and its borrow pits along every line of railway. The Government sent a special officer to report on the drainage of the Jaffna

Peninsula with the object of reducing malaria, the estimate was prohibitive. The Government distributes quinine to all school children and malarious villagers as a prophylactic which has some measure of success; directions how to combat malaria have been widely distributed in the vernacular, The only thing is for the general public to be educated in the ways of battling that disease as much can be done by individuals, but the large question of drainage is one for the Government, and in my opinion it is too vast to cope with."

November 21st.

Capillary Tubes.

Syston, Ukuwella, 24th November, 1906.

Dear Sir,—In reference to the extract from the London "Times" which I enclose, I should be glad to know if the "capillary tubes" mentioned in it are (as one would imagine) merely air spaces, or whether I am mistaken.

I am, dear Sir, yours faithfully,
W. H. BIDDULPH.

Extract referred to from a recent number of "The Times."

In quoting from a technical writer last week we gave a passage in which the word "mulch" occurred, and we have been asked what is the exact meaning of this old English term. It is curiously ignored by the dictionaries, though every peasant uses it, and probably most farmers. Very roughly speaking, it is that light caking of surface soil which protects the moisture beneath, and to mulch is to beat stuff together into a compost without binding it too tightly. The whole matter, however, is of such practical importance at a period following a long spell of dry weather that the history of the whole matter, as officially set forth by the text-book of the Royal Agricultural Society, is well worthy of being given here. It must be premised, that if surface soil is frequently stirred, kept loose in fact, moisture in the subsoil naturally travels up towards it.

"When rain falls upon the soil, some of it sinks down to replenish the stores below; but during the period of active growth, and particularly in a droughty season there is a movement of moisture from below upwards. The moisture replaces that lost at the surface by evaporation; and its direction is such that it tends to keep the soluble plant food where it is wanted, that is, about the roots of the plants. If enough water be poured into a saucer in which stands a flowerpot full of earth the surface of this mould will at length become moist, the water having travelled upwards by capillarity. But here another point has to be considered. If all the capillary tubes are open to the surface evaporation can proceed from them so freely that the underground store of moisture may be insufficient to supply the continuous demand. Hence again it is desirable to keep the surface soil, by frequently stirring, in such a state that the capillary tubes are broken, or interrupted a little below the surface. In this case the mere superficial covering of mould acts as a soil mulch, and like a layer of leaves of grass or farmyard manure, it protects the moisture beneath."

[The "tubes" are evidently the air spaces between the particles of soil.—Ed.]

ANT-HILL EARTH.

Sir,—In the October issue of the *Tropical Agriculturist**, a correspondent inquires to what uses the earth of white-ants is put, apart from its general use, mixed with cowdung for the floors of Sinhalese villagers' houses, for plugging up rat-holes in walls and floors, and for plastering mud walls, to which it gives

*Page 347, Vol. XXVII, October, 1906.

an even surface to clay. On account of its finely-comminuted nature and its excellent plasticity, it is superior to any ordinary clay. It is largely used in the manufacture of images, representing various planets, which are used in *Bali** ceremonies. For this purpose, the officiating devil-priest proceeds to an ant-hill in the evening, and with solemn invocation of the gods pronounces a benediction. The following day the required quantity of the consecrated earth is cut and removed. The clay is frequently made use of by sorcerers to prevent poisonous snakes from entering a house, the finely-pulverised earth is "charmed" and sprinkled round the outside of the building. It is also used in land disputes in the following manner:—There is an ancient Kandyan custom *Bólahadanawá*, of placing a bundle of twigs somewhere on the land in dispute, to indicate that neither of the claimants should step into the land pending a legal decision of their rights. On these occasions charmed ant-hill earth is also placed in a corner of the land, in the belief that the wrath of the presiding deities will fall upon the false litigant.

In Sinhalese medicine the clay is largely used for the treatment of bruises, boils, sprains and fractures. For bruises, for instance, the bark of the *Bomi* tree is pounded and heated over a fire and mixed into a paste with ant-hill earth and salt water. For boils, the same mixture, with the addition of turmeric, makes a very efficacious ointment.

The destructive habits of the white ants are well-known. They will attack the most durable-looking timber and reduce it in a short time to mere husk, and the losses caused by their ravages to newly-planted plants, especially young coconuts, are enormous. To protect the latter, some planters have of late years adopted a plan of smearing the nuts and roots before planting, with a paste made of white ants' clay. This is done with the idea, that as the white-ants have finished with the clay, they will not penetrate again to attack the plants, and the results have been reported as very successful. An analysis of the clay, to determine its chemical constituents, might possibly show that its use in this direction may advantageously be extended to the planting of all products, liable to the attacks of white-ants, while its use in building operations for the preservation of wall-posts might be found possible. To prevent the attacks of white-ants the Kandyans apply a layer of sand and salt to the coconut-hole, and also plant side by side, with the young coconut-plant, a *Sevendara* (Andropogon muricatus) or a *Habarala* (Alocasia macrorhiza) plant. A Sinhalese proverb goes that "a dwarf ant-hill and a short man cannot be depended upon," from the circumstance that cobras often seek refuge in these cavities.

T. B. POHATH-KEHELPANALA.

Gampola, 25th November, 1906.

PLANTAIN GROWING IN SOUTH INDIA.

Dear Sir,—The cultivation of plantains in South India presents some striking differences to the methods adopted locally, and the following summary of an account of banana growing in Malabar given in the *Indian Agriculturist* for October should prove interesting to local growers of the fruit:—

Planting is done in September and January. Young shoots from the mother plant are taken out, and after they are smeared with cow-dung and wood-ashes and well dried in the sun are stored up for planting at the proper time. Unless the shoots are thus dried and stored the crop is poor. The dried shoots are buried wholly in a slanting position about 6 feet apart in pits 3 feet square by 2 feet deep. The pits are not wholly covered up after planting, for it is said that manure while

* Images made of clay representing planets—a ceremony characterised by the recital of religious poems and stanzas for exorcising devils, curing diseases and dispelling evil-effects.

decomposing injures the shoot. From the third day after planting, watering by irrigation or otherwise is carried on. The plants generally sprout after ten days, after which they may be watered at intervals of four or five days. Manuring is done after the plants are 5 or 6 feet above the pits, when ashes and manure are put in and covered over three-fourths with loose earth. After this it is only necessary to keep down weeds. The plants bear in the ninth month, and after three months the fruits are fit for picking. A bunch weighs on an average from 20 to 25 lbs., but they go up to 30 and 40 lbs. The fruits are not allowed to ripen on the trees, but are placed in an air-tight chamber which, after being filled with smoke through a hole, is closed. This smoking is done twice daily for three or four days when the fruits become fit for eating. After removal from the hot chamber the bunches are immersed in water.

In Malabar there are two varieties of the fruit, called Attunendra and Nendra. The latter is the best, as it matures and fruits very much sooner than the former, and is altogether much to be preferred.

The following statement represents the expenditure in cultivating an acre of plantains :—

2,000 shoots @ 6 pies each	Rs. 62	8
do pits @ 3 ,, ,, ...	,, 31	4
Manuring @ 6 ,, a pit	,, 62	8
100 coolies @ 4 annas for weeding	,, 25	0
Bamboo props for plants @ 6 pies each	,, 62	8
4 coolies for 5 months @ Rs. 5 per head	,, 100	0
2 Watchmen for 3 months to protect fruit at Rs. 5 ...	,, 30	0
Sundry expenses	,, 15	0
Government tax	,, 3	0
Rent for ground	,, 2	0
Pay of Agent @ Rs. 10 per mensem	,, 120	0
Total ...	Rs. 513	12

The income from the above may be estimated as follows :—

100,000 fruits (taking 50 fruits to the bunch) at Rs. 8 per 1,000 (rough, this price goes up at times to Rs. 15 per 1,000)	Rs. 800	0
(Assuming on an average that each plant gives two shoots for sale after the planter takes what he requires 4,000 shoots at 6 pies each	,, 125	0
Leaves	,, 25	0
Total ...	Rs. 950	0
Expenditure	,, 513	0
Net profit per acre ...	Rs. 437	0

This is considered a fair statement, the expenditure being estimated on a liberal scale.

If anything could be done with the fibre of the stems, the profits would, of course, be considerably enhanced.

It would be most interesting to get comparative figures from Ceylon, and a criticism of the above statement from such well-known fruit growers as Mr. Francis Dabiel of Colombo, and Mr. George Amarasekera of Hanwella.

Yours truly,

C. D.

PADDY REAPING MACHINE.

Dear Sir,—Can you inform me with what machine they reap the paddy fields in America, where they grow rice on a large scale?

I am thinking of planting 700 or 800 acres with European machinery, and I would like your advice.

I intend to plough with 3 furrow ploughs, and drill in the seed with drills, and then try the reaper and binder for reaping it.

Do you think this mode of cultivation will work? The rice, I forgot to mention, is dry rice, or as you call it Hill-paddy, and the land is fairly level. By the present mode of cultivation it costs the Javanese twice as much to produce an acre of paddy as it costs an Australian to produce an acre of wheat. If you will kindly help me with a little information on this subject, I will be very thankful,

Yours sincerely.

A. ALLEN.

Kesamben, Java, 14th Nov., 1906.

[The machines in use in America are, I believe, large combined reapers and threshers. Paddy is grown there at rates below even those of Bengal, the cheapest eastern country. Some attempts of Europeans to grow rice in Ceylon failed, but that is no proof that on flat land it might not be made profitable.—Ed.]

The Ceylon Board of Agriculture.

The Twenty-fifth meeting of the Board of Agriculture was held in the Council Chamber at 12 noon on Monday, November 5th, 1906.

His Excellency the Governor presided.

Others present were:—The Hon'ble Messrs. G. M. Fowler, J. Ferguson, F Beven, S. C. Obeyesekere, Mr. H. T. S. Ward, Drs. J. C. Willis, H. M. Fernando, G. W. Sturgess, Sir William Twynam, Mr. C. Drieberg, Mr. D. S. Dias Bandaranayake (Maha Mudaliyar) and the Secretary.

Mr. L. W. A. de Soysa was present as a visitor.

Business Done.

1. The Minutes of the last Meeting were read and confirmed.

2. The Secretary read a telegram received from Mr. J. H. Meedeniya Ratemahatmeya, regretting his inability to attend the meeting.

3. List of new members was read.

4. The report of the Curator, Royal Botanic Gardens, on the sections judged by him at the Kegalle Agri-Horticultural Show in September last was read.

5. Progress Report No. XXIV was circulated. The Hon'ble Mr. Ferguson asked for a list of Agri-Horticultural Shows held under the auspices of the Society.

6. After dealing with some points mentioned in the Progress Report, His Excellency the Governor informed the Board that it was no longer possible to spare the services of a member of the Civil Service as Secretary to the Society. His Excellency therefore proposed to appoint Mr. M. Kelway Bamber as Secretary to the Society, and trusted that the proposal would meet with the approval of the Board. The Hon'ble Mr. Ferguson was of opinion that the appointment of Mr. Bamber would afford universal satisfaction, provided Mr. Bamber's private work for the planters throughout the Island did not interfere with the performance of his duties as Secretary. The Hon'ble Mr. Obeyesekere raised the question of the cost

of the new arrangement In reply to Mr. Ferguson, His Excellency stated that he could assure the Board that they would have the full value of Mr. Bamber's services. Financially the new arrangement would probably cost the Island less than the present arrangement did all round.

7. The Secretary read a letter from Mr. H. B. Rambukwelle expressing his thanks to the Board for the vote of condolence passed at its meeting on the 17th September.

8. Dr. Willis read a paper on 'Some Possibilities in Fruit Culture in Ceylon.' A discussion followed, in which His Excellency the Governor, Mr. Ferguson, Mr. Obeyesekere, Mr. Ward and others took part.

9. Mr. C. Drieberg showed some samples of banana flour, etc., manufactured by an English firm.

The meeting terminated at 1-15 p.m.

The Twenty-sixth Meeting of the Board of Agriculture was held in the Council Chamber at 12 noon on Monday, 3rd December, 1906.

His Excellency the Governor presided.

Others present were:—The Hon'ble Messrs. J. P. Lewis, E. Rosling, S. C. Obeyesekere, P. Arunachalam, J. Ferguson, Sir William Twynam, Drs. J. C. Willis, H. M. Fernando, the Maha Mudaliyar, Messrs. C. M. Lushington, L. W. Booth, J. Harward, E. E. Green, M. Kelway Bamber, H. Wright, C. Drieberg, G. A. Joseph, G. W. Sturgess, and the Secretary.

Mr. M. Subramaniam was present as a visitor.

Business Done.

1. The Minutes of the last meeting were read and confirmed.

2. Progress Report No. XXV was circulated.

3. The Secretary announced that His Excellency had been pleased to nominate Mr. C. Valoopillai of Anuradhapura as a member of the Board for the North-Central Province in succession to the late Mr. L. B. Nikawewa Disava.

4. Dr. Willis proposed that the recommendation of the Finance Committee be approved, to the effect that a sum not exceeding Rs. 500 be allowed to enable Mr. C. Drieberg, Superintendent, School Gardens, to visit the Agricultural and Industrial Exhibition to be held at Calcutta in December, and to travel through the Bangalore and other districts with a view to gathering information on the subject of sericulture. Mr. E. E. Green, Government Entomologist, seconded. The Hon'ble Mr. J. Ferguson also spoke in support of the motion, which was carried unanimously.

5. The Secretary read a letter from Mr. W. D. Gibbon and a telegram from Mr. J. H. Meedeniya Ratemahatmeya, regretting their inability to attend the meeting.

6. Dr. A. K. Coomaraswamy not having arrived, the reading of his paper on Native Arts and Crafts was postponed till later in the meeting. Having made a few remarks on the subject, His Excellency the Governor, who was obliged to leave early, vacated the chair. At His Excellency's desire the chair was taken by Mr. C. M. Lushington.

7. The Secretary read the report of the sub-Committee appointed at the meeting of September 17th to reconsider the provisions of the proposed Pests Ordinance with reference to a memorandum on the subject submitted by Sir

William Twynam. A lengthy discussion followed, in which Messrs. Lushington, Arunachalam, Ferguson, Rosling and Booth and Dr. Willis took part. It was finally resolved on the motion of the Hon'ble Mr. P. Arunachalam, seconded by the Hon'ble Mr. J. Ferguson, that in view of the fact that the report of the sub-Committee had not been long enough in the hands of members of the Board to permit of its careful consideration, the discussion of the matter be deferred till the next meeting of the Board.

8. Dr. A. K. Coomaraswamy read a paper on "Suggestions for the Encouragement of Indigenous Arts and Crafts in Ceylon." A discussion followed in which Mr. Harward, Director of Public Instruction, Dr. Willis and Mr. Ferguson took part.

The meeting terminated at 1-45 p.m.

A Special Meeting of the Board of Agriculture was held in the Council Chamber at 12 noon on Monday, the 17th December, 1906, to consider the report of the sub-Committee on the proposed Pests Ordinance.

In the absence of His Excellency the Governor, the chair was taken by Sir William Twynam, K.C.M.G.

Others present were the Hon'ble Messrs. J. P. Lewis, S. C. Obeyesekere, J. Ferguson, C.M.G., and Francis Beven, Dr. J. C. Willis, Messrs. H. T. S. Ward, E. B. Denham, W. Dunuwille Disava, Herbert Wright, M. Kelway Bamber, R. Morison, W. D. Gibbon, Daniel Joseph, R. E. Paranagama Ratemahatmeya, and the Secretary.

Messrs. T. A. Carey and M. Subramaniam were present as visitors.

BUSINESS DONE.

1. Before proceeding to the business of the day the Chairman, Sir William Twynam proposed: "That the members of this Board desire to place on record their deep sense of the loss they have sustained in the sudden removal from their midst of the late Hon'ble Sir Alexander Ashmore, K.C.M.G., who was a prominent member of the Board, and always a zealous worker in the promotion of its interests; and they desire to convey to Lady Ashmore their deep and heartfelt sympathy in the sad and sudden bereavement that has befallen her."

The motion was seconded by the Hon. Mr. S. C. Obeyesekere and carried unanimously, all standing.

2. The Secretary read a telegram from the Maha Mudaliyar and a letter from Mr. C. P. Hayley regretting their inability to be present at the meeting.

3. Dr. J. C. Willis moved the adoption of the report of the sub-Committee on the proposed Pests Ordinance, which was submitted at the meeting of the Board on the 3rd December.

The Hon'ble Mr. Obeyesekere seconded.

With the permission of the Chairman the Secretary, Mr. A. N. Galbraith. spoke to the motion, and suggested a slight alteration in the amended draft Ordinance put forward by the sub-Committee.

The Hon'ble Mr. Obeyesekere seconded and the amendment was carried.

Considerable discussion followed, in which almost all the members present took part. Further amendments were proposed by the Secretary, seconded by Mr. Denham, and by Mr. Denham, seconded by the Hon'ble Mr. Lewis, and passed.

It was finally unanimously resolved that the report of the sub-Committee be adopted, together with the amended draft Ordinance, framed by the sub-Committee with the three further amendments referred to.

The meeting terminated at 1-15. p.m.

Agricultural Society Progress Report, XXV.

1. *Local Branches.*– Two new branch societies have been formed—one for Gangaboda Pattu (Galle) and one for Hinidum Pattu. The total number of branch societies is 48, while the total membership of the Society is 1,127. It has been decided to amalgamate the Gangaboda Pattu (Matara) branch with the local branch at Matara from 1907.

Gangaboda Pattu Branch (Galle).—An inaugural meeting was held at the Baddegama Gansabhawa on the 16th October. One of the Society's Agricultural Instructors, Mr. N. Wickramaratne, was present and assisted in the proceedings. At a subsequent meeting on the 3rd November Mr. H. D. Perera, Mudaliyar of the Pattu, was elected President of the Society, and Mr. C. E. Gunatileka, President of the Village Tribunals, Vice-President. The new society proposes to undertake the establishment of a seed bank, the opening of an experimental garden, and an experiment in growing castor oil plants with a view to starting silk cultivation. Mr. M. A. Jayasinhe, Deputy Coroner, has presented the society with a piece of land at Nagoda for the experimental garden. In connection with the seed bank, it was agreed that as a beginning the members should contribute two or more bushels of paddy apiece ; that 25 per cent. interest be charged on paddy lent from the bank ; and that the contributors be at liberty to take back their paddy after five years. Seventy bushels were promised by thirty-eight members.

Hinidum Pattu Branch.—The local branch at Hiniduma was formed following an inaugural meeting held at the Nagoda resthouse under the presidency of Mr. A. L. Amarasekare, Mudaliyar. The Agricultural Instructor was again present. The programme of work adopted at this meeting includes the opening of an experimental garden ; sericulture ; popularising of school gardens, &c.

Mr. Wickramaratne took with him on his tour two trays, specially made at the Peradeniya Silk Farm, containing silk worms, eggs, and cocoons, and gave ocular demonstration of the method of handling the worms. Amongst those who expressed their interest in the subject of sericulture was the Rev. Father Schaefer of Hiniduma, who contemplates its introduction amongst the boys of his school and orphanage.

This is the first occasion on which one of the Society's Agricultural Instructors has been on tour. It is hoped that by February next the course of training which they are at present undergoing will be sufficiently complete to justify their being regularly sent on tour in different districts. Any local societies desiring their services should apply for them in the course of the next two months. It is intended that the Instructors should visit the various local branches, attend their meetings, give lectures and instruction, and ascertain in what directions the local societie require the assistance of the parent society, or the expert advice of the scientific staff at Peradeniya.

Dumbara Branch.—I was present with Mr. M. Kelway Bamber, Government Chemist, at a general meeting of the Dumbara Agricultural Society, held on the 3rd November at Teldeniya. The main object of our visit was to ascertain how far Teldeniya would be a suitable centre for the experiment the Society proposes to make in the improvement of native tobacco by a more scientific method of curing. A number of tobacco growers were present at the meeting and availed themselves of the opportunity to consult Mr. Bamber on the question of manuring, plucking, curing, &c. The Secretary read an interesting report of the progress of the Society since its formation in April last.

A meeting of the Co-operative Credit Society followed, at which it was decided to lend money to tobacco cultivators, not exceeding Rs. 50 to each applicant.

Harispattu Branch.—A meeting of the committee of this society was held on the 18th November, when rules for the management of the proposed seed paddy store were passed. The chairman, Mr. P. B Nugawela, Ratemahatmaya, and eight other members undertook to contribute between them 85 bushels of paddy.

The committee decided to allow a grant of Rs. 25 towards the opening of each of the five experimental gardens proposed.

Vavuniya Branch.—At the meeting of the Vavuniya Branch held on 27th November several members undertook to experiment with *rotations of crops on chenas*, as follows:—Kurakkan in September, gingelly in April, manioca in July, 1907, kollu in February, manioca in July, 1908, and kurakkan in September, 1909.

Forwarding Agency.—Rules were adopted for the formation of a forwarding agency, the object of which is to enable the people of the district to dispose of their produce in Colombo, Jaffna, or other suitable markets. Some of the products with which it is proposed to deal are: ghee, honey, tamarind, limes, eggs, fowls, paddy, and cattle. Under the auspices of the agency ten black cattle locally reared were sent in October to the Colombo market, with the object of seeing how the price obtainable in Colombo compares with that paid by the itinerating Moorman who barters for the animals on the spot in exchange for clothing, apparel, &c. I have not yet received the report of the local branch Society as to the financial result of the venture.

2. *Agricultural Shows.*—I was present at the Agricultural Fair held at *Telijjawila* on the 15th November. The fair was originally fixed for the 31st October, but had to be postponed owing to the heavy rains. It was held in the grounds of Mudaliyar J. A. Wickremeratne's own house, the exhibition of fruit and vegetables being accommodated in a large cross-shaped building specially erected for the purpose at the Mudaliyar's own expense.

The fair was opened in the afternoon by Mr. G. M. Cookson, Assistant Government Agent, Matara. There was a very large attendance of villagers and headmen. The display of vegetables and fruit was a creditable one, despite the bad weather of the previous month. The show building, which is intended to be a permanent one, proved itself admirably suited to the purpose. The absence of show counters running down the centres of the wings of the building allowed a roomy passage way, a feature not usually found in such buildings, as I have had occasion to remark in a previous report.

The fair was intended as a preliminary to the larger agricultural show to be held next year. Its character as a fair was emphasised by the presence of various parties of dancers, jesters, and acrobats, while the obvious prototype of the "great wheel" at Earl's Court was much patronised by the children. In this respect the Telijjawila show differed entirely from the market shows held at Minuwangoda and Yatiyantota.

Wellaboda Pattu (Galle) Agri-Horticultural Show.—Owing to the heavy rains the local committee have been obliged to postpone this show, which was to have been held on the 16th and 17th November, at Ambalangoda. It is now fixed for the 20th and 21st December.

Trincomalee Market Show.—At a committee meeting held on the 16th November, it was decided to hold a market show at the Trincomalee Town Hall on the 2nd April, 1907, commencing at 9 a.m.

Batticaloa Agri-Horticultural Show.—An Agri-Horticultural Show under the auspices of the Batticaloa Agricultural Society, will be held early in 1907.

The Nuwara Eliya Agri-Horticultural Show will be held on the 2nd and 3rd April next.

The Telijjawila Agri-Horticultural Show will be held at Telijjawila on the 15th March, 1907.

Uva Agri-Horticultural Show will be held at Badulla early in May, 1907.

Matale Agri-Horticultural Show will be held probably early in June.

Kandy Agri-Horticultural Show.—The Kandy Branch has decided to hold an Agri-Horticultural Show in August, at the end of the "perahera" season.

3. *Foreign Vegetable Seeds.*—From the list of seeds quoted in the last Progress Report, No. XXIV., as having been ordered for the Society, the following varieties must be omitted, namely, French dwarf beans, capsicum, chilli, Chinese cabbage, gourd, melon, onion, parsnip, potseed, pumpkin, and spinach. Amended list is as follows:—

Beans	Cauliflower	Lettuce	Turnip
Beet	Celery	Okra	Tomato
Cabbage	Cucumber	Peas	Vegetable Marrow
Carrot	Egg-plant	Radish	Kohlrabi

The seeds will be distributed to applicants by the Superintendent of School Gardens, Colombo, in packets, price not exceeding 20 cents each.

4. *Cotton.*—56 lb. of selected Sea Island cotton seed from the West Indies has been supplied to the Dumbara Branch for experimental cultivation. Mr. T. B. Pohath-Kehelpanala of Gampola has applied for a quantity sufficient to plant half an acre.

At the request of a member of the Board of Agriculture samples of locally grown Caravonica cotton—of both the "wool" and the "silk" varieties—have been sent to a gentleman of his acquaintance who is connected with the cotton trade in Liverpool. The samples were kindly supplied by Mr. J. W. C. de Soysa.

5. *Varieties of Indian Arecanuts.*—Orders for seed nuts are now being booked and will be forwarded to India early this month.

6. *Umbrella Tree.*—Seeds of the "Udai" (umbrella) tree (*Accacia planifrons*) have been distributed to the following districts for experimental cultivation:—Peradeniya, Henaratgoda, Galle, Chilaw, Colombo, Matugama, and Batticaloa, A few more seeds are still available.

7. *Saltbush seed* has been sent to applicants in the following districts:—Batticaloa, Puttalam, Balangoda, Mannar, Peradeniya, Henaratgoda, Delft, The whole supply is exhausted.

8. *Jamaica Seedling Yams.*—Through the courtesy of the Secretary of the Jamaica Agricultural Society tubers of yams of the following varieties have been received:—*Dioscorea alata, D. sativa D. aculenta, D. triphylla.* These have been distributed among the following:—Curator, Royal Botanic Gardens, Peradeniya; Superintendent, Silk Farm, Peradeniya; Secretaries of the Kurunegala, Nuwara Eliya, Matale, Harispattu, Badulla, Dumbara, Gangaboda Pattu (Galle), Trincomalee, Katunayake, Three Korales and Lower Bulatgama Agricultural Societies; Government Stock Garden; and to individual members in Veyangoda, Colombo, Ratnapura, Badulla, Henaratgoda, Kelaniya, Mutwal, and Wanni Hatpattu.

9. *Tobacco.*—Two samples of tobacco grown in the Eastern Province (Tamankaduwa and Batticaloa) were received from the Secretary of the Batticaloa Agricultural Society for valuation in Colombo with an inquiry whether this tobacco would suit the purposes of curing for the foreign market. The samples have been sent to two firms in Colombo for their report.

10. *Improved Avocado Pears.*—Three parcels containing seeds of improved varieties of avocado pears were received from the United States Department of Agriculture. As the seeds were long on the journey and some appeared to have suffered by the voyage, the consignment was sent to the Director, Royal Botanic Gardens, Peradeniya, where the seeds will be tried and supplies will be sent to applicants by the Director according to the number of plants successfully propagated.

11. *Insect Pests:* (1) *Mealy Bug on Cotton.*—Specimens of some insects found by me on the bolls of a few plants of cotton growing in the Weligama Stock Garden, when recently on a visit there in connection with the Fruit and Vegetable Show at Telijjawila, were forwarded to the Government Entomologist, who reported as follows:—

"The white insect is the common 'mealy bug' (*Dactylopius citri*). I do not anticipate that this will prove a serious pest of cotton in Ceylon; but should it show signs of increasing to a dangerous extent, it may be kept in check by spraying with kerosine emulsion. I was unable to find the small black fly, which had probably escaped in transit. There is a small black-winged bug that frequents cotton bolls, especially after they have burst—and often swarms in the lint. It can be readily driven off by exposing the lint to the hot sun for a few hours. The name of this insect is *Oxycarenus laetus*."

(2) *Cucumber Fly.*—Specimens of a yellow fly which attacks gourds, &c., have been sent by the Trincomalee Agricultural Society to the Government Entomologist, who identifies them as *Dacus sp.*, the well-known cucumber fly, and states that:—

"They will attack gourds, melons, cucumbers, vegetable marrows, and all allied fruits. The only satisfactory method of circumventing this pest is to enclose the young fruits (immediately the flower has set) in muslin bags large enough to contain the mature fruit. Any diseased fruits of this kind should be systematically collected and destroyed. If allowed to rot upon the ground, the flies will mature and infest other fruits."

12. *Fruit Trees for School Gardens.*—Mr. M. D. S. A. Wijenayake, Stock Inspector at Kurunegala, has offered to make a present of mangosteen, nutmeg, clove, and num-num plants to all school gardens in the North-Western Province. These will be sent to 26 school gardens by the Superintendent of School Gardens, who has accepted the offer. Cost of transport will be met by the Society.

13. *Examination of Agricultural Instructors.*—Under the scheme recently adopted of training Stock Inspectors in agricultural work, an examination in Botany, &c., was held on the 1st instant at the office of the Government Veterinary Surgeon. The papers were prepared by the Dierector, Royal Botanic Gardens, and the Controller, Experiment Station Peradeniya. The following candidates were examined: P. C. J. Ferando, A. M. Fernando, M. D. S. A. Wijenayake, B. D. Stephen, and D. L. Dias, and the two Agricultural Instructors of the Society—N. Wickramaratne and L. A. D. Silva.

14. *Castration of Cattle.*—The progress made with regard to castration of cattle is as follows:—

Number of demonstrations held during 1906	138
Number of cattle operated upon during 1906	2,868
Number of owners who brought cattle during 1906	2,239
Number of men trained in the operation during 1906 ...	136

at an average cost, including all expenses, of about Rs. 1·06 per head of cattle operated upon—training of men free.

15. The Society regrets the death of L. B. Nikawewa Dissawe, who was a member of the Board of Agriculture for the North-Central Province.

16. *Honour to an Agriculturist*.—At the Investiture of Native Ranks held on the occasion of His Majesty the King's Birthday, 9th November, Mr. A. E. Rajapakse, Muhandiram, Chairman of the Katunayake Branch of the Society, and a prominent agriculturist in the district, was created a Mudaliyar "for the excellent work done by him in the district by giving time and money in the encouragement of the improvement of agriculture amongst the people of the country."

17. *Publications*.—The paper read by Mr. E. B. Denham, C.C.S., at the September meeting of the Board of Agriculture, on the subject of "Uses and Objects of Agricultural Societies" is now ready in pamphlet form, and will be distributed among members.

The Editor of the *Sihala Samaya* having forwarded 50 copies of the edition of that paper containing a translation of the proceedings of the last meeting of the Board, these were distributed among the Local Branches of the Society, as usual.

A. N. GALBRAITH,

Colombo, December 3, 1906. *Secretary, Ceylon Agricultural Society.*